AD-A137 836 ANNUAL TROPICAL CYCLONE REPORT 1983(U) NAVAL OCEANOGRAPHY COMMAND CENTER/JOINT TYPHOON WARNING CENTER FPO SAN FRANCISCO 96630 B L HOLT ET AL. 1983 1/3

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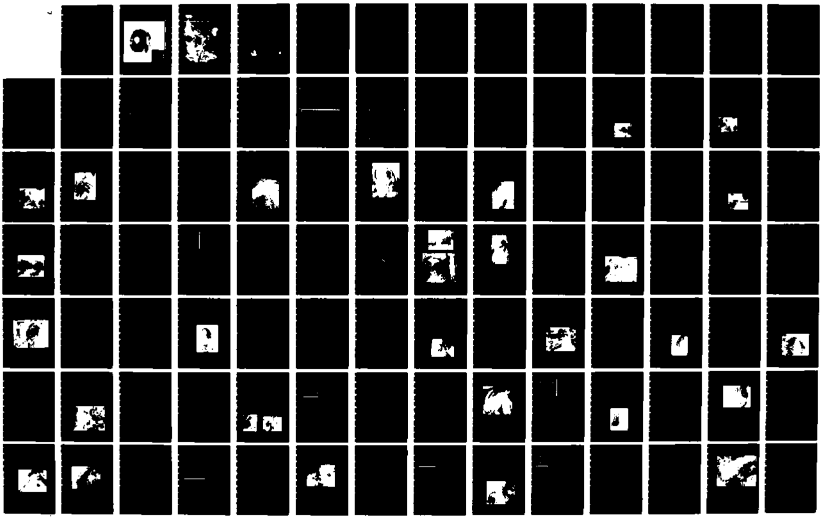

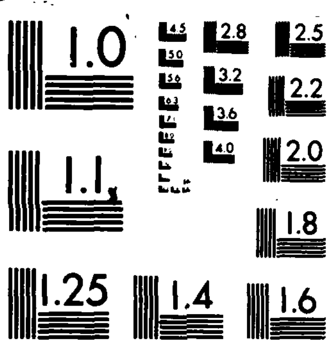

MICROCOPY RESOLUTION TEST CHART
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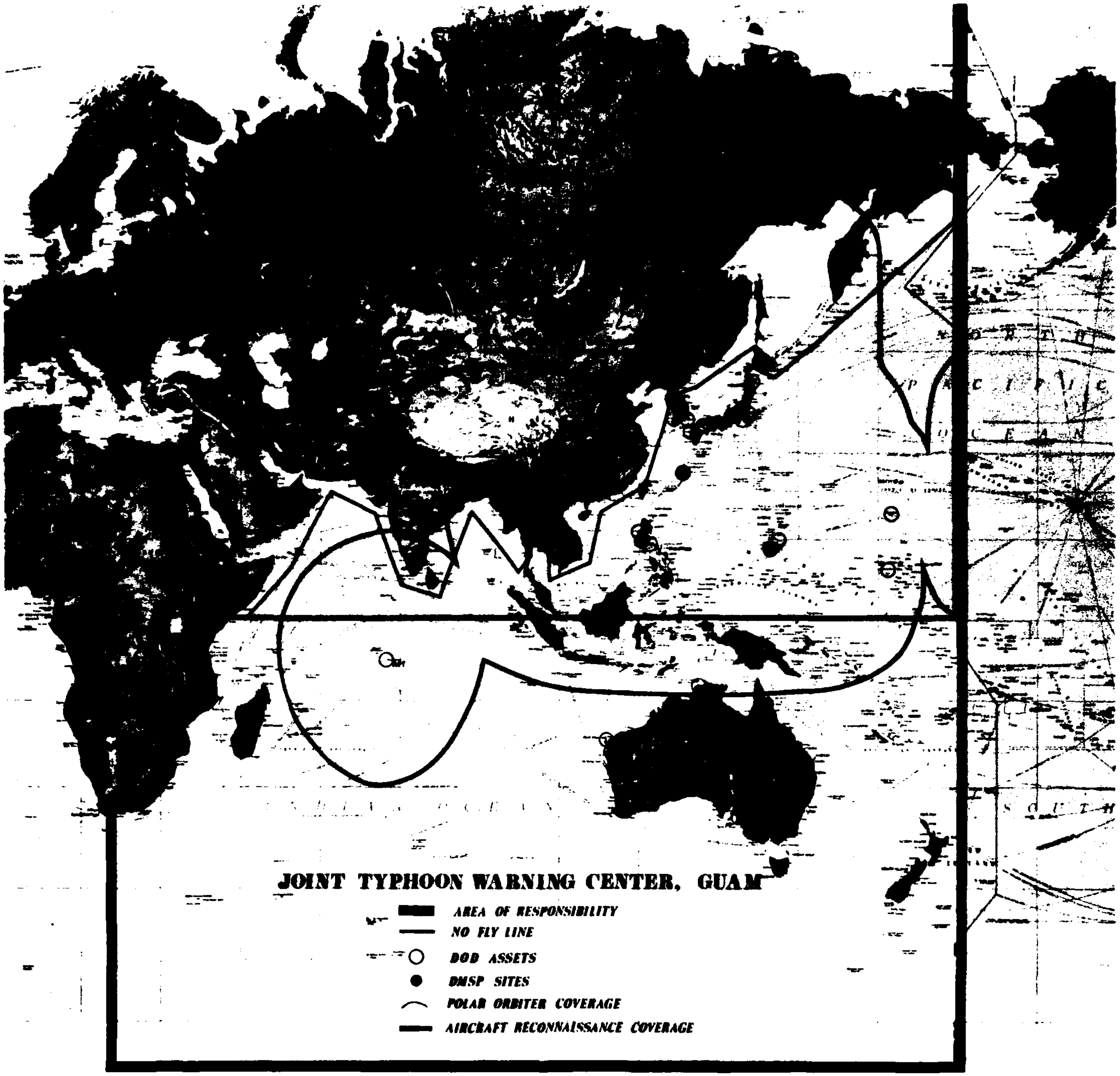
1983 ANNUAL TROPICAL CYCLONE REPORT

JOINT TYPHOON WARNING CENTER
GUAM, MARIANA ISLANDS


JOINT TYPHOON WARNING CENTER, GUAM
AREA OF RESPONSIBILITY
NO FLY LINE
DOD ASSETS
DMSP SITES
POLAR ORBITER COVERAGE
AIRCRAFT RECONNAISSANCE COVERAGE

U.S. NAVAL OCEANOGRAPHY COMMAND CENTER
JOINT TYPHOON WARNING CENTER
COMNAVMARIANAS BOX 17
FPO SAN FRANCISCO 96630

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FOREWORD

The Annual Tropical Cyclone Report is prepared by the staff of the Joint Typhoon Warning Center (JTWC), a combined USAF/USN organization operating under the command of the Commanding Officer, U.S. Naval Oceanography Command Center/Joint Typhoon Warning Center, Guam. JTWC was established in April 1959 when USCINCPAC directed USCINCPACFLT to provide a single tropical cyclone warning center for the western North Pacific region. The operations of JTWC are guided by USCINCPACINST 3140.1 (series).

The mission of the Joint Typhoon Warning Center is multi-faceted and includes:

1. Continuous meteorological monitoring of all tropical activity in the Northern and Southern Hemispheres, from 180 degrees longitude westward to the east coast of Africa, to anticipate tropical cyclone development.

2. Issuing warnings for all significant tropical cyclones in the above area of responsibility.

3. Determination or reconnaissance requirements for tropical cyclone surveillance and assignment of appropriate priorities.

4. In depth post-storm analysis of all tropical cyclones occurring within the western North Pacific and North Indian Oceans for publication in this report.

5. Cooperation with the Naval Environmental Prediction Research Facility, Monterey, California, on the operational evaluation of tropical cyclone models and forecast aids, and the development of new techniques to support operational forecast scenarios.

Should JTWC become incapacitated, the Alternate JTWC (AJTWC), located at the U.S. Naval Western Oceanography Center, Pearl Harbor, Hawaii, assumes warning responsibilities. Assistance in determining satellite reconnaissance requirements, and in obtaining the resultant data, is provided by Detachment 4, 1WW, Hickman AFB, Hawaii.

Satellite imagery used throughout this report represents data obtained by the tropical cyclone satellite surveillance network. The personnel of Det 1, 1WW, colocated with JTWC at Nimitz Hill, Guam, coordinate the satellite acquisitions and tropical cyclone surveillance by the following units:

Det 5, 1WW, Clark AB, RP
Det 8, 1WW, Kadena AB, Japan
Det 15, 30WS, Osan AB, Korea
Det 4, 1WW, Hickam AFB, Hawaii
Air Force Global Weather Central, Offutt AFB, Nebraska

In addition, the Naval Oceanography Command Detachment, Diego Garcia, and DMSP equipped U.S. Navy aircraft carriers have been instrumental in providing vital satellite position fixes of tropical disturbances in the Indian Ocean.

In line with the proposals to implement metric units of measurements within the United States over the next few years, various civilian and military organizations have begun extensive educational programs through use of metric equivalents in their publications. This report will include metric unit equivalent measures whenever possible.

A special thanks is extended to the men and women of: 27th Communication Squadron, Operating Location C, for their continuing support by providing high quality, real-time satellite imagery; the Pacific Fleet Audio-Visual Center, Guam, for their assistance in the reproduction of satellite and graphics data for this report; to the Navy Publications and Printing Service Branch Office, Guam, for their efforts to meet publication deadlines; and to Mrs. Bernadita Manipol for her patience and perseverance in typing the many drafts and the final manuscript of the report.

NOTE: Appendix 5 contains information on how to obtain past issues of the <u>Annual Typhoon Report</u> (redesignated <u>Annual Tropical Cyclone Report</u> in 1980).

TABLE OF CONTENTS

CHAPTER I - OPERATIONAL PROCEDURES

1. GENERAL

The Joint Typhoon Warning Center (JTWC) provides a variety of routine services to the organizations within its area of responsibility, including:

a. Significant Tropical Weather Advisories: issued daily, this product describes all tropical disturbances and assesses their potential for further development;

b. Tropical Cyclone Formation Alerts: issued when synoptic, satellite and/or aircraft reconnaissance data indicate development of a significant tropical cyclone in a specified area is likely;

c. Tropical Cyclone Warnings: issued periodically throughout each day for significant tropical cyclones, giving forecasts of position and intensity of the system; and

d. Prognostic Reasoning Messages: issued twice daily for tropical storms and typhoons in the western North Pacific; these messages discuss the rationale behind the most recent warnings.

The recipients of the services of JTWC essentially determine the content of JTWC's products according to their ever-changing requirements. Thus, the spectrum of the routine services is subject to change from year to year; such changes are usually the result of deliberations held at the Annual *Tropical Cyclone Conference.*

2. DATA SOURCES

a. COMPUTER PRODUCTS:

A standard array of synoptic-scale computer analyses and prognostic charts are available from the Fleet Numerical Oceanography Center (FLENUMOCEANCEN) at Monterey, California. These products are provided via the Naval Environmental Data Network (NEDN).

b. CONVENTIONAL DATA:

This data set is comprised of land-based and shipboard surface and upper-air observations taken at or near synoptic times, cloud-motion winds derived twice daily from satellite data, and enroute meteorological observations from commercial and military aircraft (AIREPS) within six hours of synoptic times. Conventional data charts are prepared daily at 0000Z and 1200Z using hand- and computer-plotted data for the surface/gradient and 200 mb (upper-tropospheric) levels. In addition to these analyses, charts at the 850, 700, and 500 mb levels are computer-plotted from rawinsonde/pibal observations for the 12-hour synoptic times.

c. AIRCRAFT RECONNAISSANCE:

Aircraft weather reconnaissance data are invaluable for the position of the center of developing systems and essential for the accurate determination of numerous parameters, including;

- eye/center temperature and dewpoint
- maximum surface and flight level wind
- minimum sea level pressure
- horizontal wind distribution

In addition, wind and pressure-height data at the 500 and/or 400 mb level, provided by the aircraft while enroute to, or from fix missions, provide a valuable supplement to the all too sparse data fields of JTWC's area of responsiblity. A comprehensive discussion of aircraft weather reconnaissance is presented in Chapter II.

d. SATELLITE RECONNAISSANCE:

Meteorological satellite data obtained from Defense Meteorological Satellite Program (DMSP), and National Oceanic and Atmospheric Administration (NOAA), spacecraft played a major role in the early detection and tracking of tropical cyclones in 1983. A discussion of the role of these programs is presented in Chapter II.

e. RADAR RECONNAISSANCE:

During 1983, as in previous years, land radar coverage was utilized extensively when available. Once a tropical cyclone moved within the range of land radar sites, their reports were essential for determination of small scale movement. Use of radar reports during 1983 is discussed in Chapter II.

3. COMMUNICATIONS

a. JTWC currently has access to three primary communications circuits.

(1) The Automated Digital Network (AUTODIN) is used for dissemination of warnings and other related bulletins to Department of Defense installations. These messages are relayed for further transmission over U.S. Navy Fleet Broadcasts, and U.S. Coast Guard CW (continuous wave Morse code) and voice broadcasts. Inbound message traffic for JTWC is received via AUTODIN addressed to NAVOCEANCOMCEN GUAM or JTWC GUAM.

(2) The Air Force Automated Weather Network (AWN) provides weather data to JTWC through a dedicated circuit from the Automated Digital Weather Switch (ADWS) at Hickam AFB, Hawaii. The ADWS selects and routes the large volume of meteorological reports necessary to satisfy JTWC requirements for the right data at the right time. Weather bulletins prepared by JTWC are inserted into the AWN circuit via the NEDS and the Nimitz Hill Naval Telecommunication Center (NTCC) of the Naval Communications Area Master Station Western Pacific.

(3) The Naval Environmental Data Network (NEDN) is the communications link with the computers at FLENUMOCEANCEN. JTWC is able to receive environmental data from FLENUMOCEANCEN and access the computers directly to run various program.

b. The Naval Environmental Display Station (NEDS) has become the backbone of the JTWC communications system; it is the terminal that provides a direct interface with the NEDN and AWN; and it is capable of preparing messages for indirect AUTODIN transmission. The NEDS also provides a means for the Typhoon Duty Officer (TDO) to request forecast aids which are processed on the FLENUMOCEANCEN computers and transmitted to the TDO over the NEDN circuit.

4. ANALYSES

A composite surface/gradient level (3000 ft (915 m)) manual analysis of the JTWC area of responsibility is accomplished on the 0000Z and 1200Z conventional data. Analysis of the wind field using streamlines is stressed for tropical and subtropical regions. Analysis of the pressure field is accomplished routinely by the Naval Oceanography Command Center (NOCC) Operations watch-team and may be used in conjunction with JTWC's analysis of tropical wind fields.

A composite upper-tropospheric manual streamline analysis is accomplished daily utilizing rawinsonde data from 300 mb through 100 mb, winds derived from cloud motion analysis, and AIREPS (plus or minus 6 hours) at or above 29,000 feet (8,839 m). Wind and height data are used to arrive at a representative analysis of tropical cyclone outflow patterns, mid-latitude steering currents, and features that may influence tropical cyclone intensity. All charts are hand-plotted over areas of tropical cyclone activity to provide all available data as soon as possible to the TDO. These charts are augmented by the computer-plotted charts for the final analysis.

Computer-plotted charts for the 850, 700, and 500 mb levels are available for streamline or height-change analyses from the 0000Z and 1200Z data base. Additional sectional charts at intermediate synoptic times and auxiliary charts such as station-time plot diagrams and pressure-change charts are also analyzed during periods of significant tropical cyclone activity.

5. FORECAST AIDS

The following objective techniques were employed in tropical cyclone forecasting during 1983 (a description of these techniques is presented in Chapter IV):

a. MOVEMENT

(1) 12-HR EXTRAPOLATION

(2) CLIMATOLOGY

(3) HPAC (Extrapolation/Climatology)

(4) BPAC (Extrapolation/Climatology)

(5) CYCLOPS (Steering)

(6) TYAN78 (Analog)

(7) ONE-WAY TROPICAL CYCLONE MODEL (Dynamic)

(8) NESTED TROPICAL CYCLONE MODEL (Dynamic)

(9) TAPT (Empirical)

(10) COSMOS (Model Output Statistics)

b. INTENSITY

(1) THETA E (Empirical)

(2) WIND RADIUS (Analytical)

(3) DVORAK (Empirical)

6. FORECAST PROCEDURES

a. INITIAL POSITIONING:

In the preparation of each warning an accurate location (fix) of the tropical cyclone's surface center within two to three hours of warning time is of prime importance. JTWC uses the Selective Reconnaissance Program (SRP) to levy an optimal mix of available resources to obtain the necessary fix information. Whenever a tropical cyclone is poorly defined or the actual surface center cannot be determined, and when conflicting fix information is received, the "best estimate" of the surface location is subjectively determined from the analysis of all available data. If the fix data are not available due to reconnaissance platform malfunctions or communication problems, synoptic data or extrapolation from previous fixes are used. The warning position is then obtained by determining the "best track" of the tropical cyclone up to the last fix, or best estimate of the position of its surface center, and forecasting its movement to the warning time.

b. TRACK FORECASTING:

A preliminary forecast track is developed based on an evaluation of the rationale behind the previous warning and the guidance given by the most recent objective techniques and numerical prognoses. This preliminary track is subjectively modified based on the following considerations:

(1) The prospects for recurvature or erratic movement are evaluated. This evaluation is based primarily on the present and forecast, positions and amplitudes of the middle-tropospheric, mid-latitude troughs as depicted on the latest upper air analyses and numerical prognoses.

(2) Determination of the best steering level is partly influenced by the maturity and vertical extent of the tropical cyclone. For mature tropical cyclones located south of the subtropical ridge, forecast changes in speed of movement are closely correlated with anticipated changes in the intensity or relative position of the ridge. When steering currents are relatively weak, the tendency for tropical cyclones to move northward due to internal forces is an important consideration.

(3) Over the 12- to 72-hour forecast period, speed of movement during the early forecast period is usually biased toward persistence, while the subsequent forecast periods are biased toward objective

techniques. When a tropical cyclone moves poleward, and toward the mid-latitude steering currents, speed of movement becomes increasingly more biased toward a selective group of objective techniques capable of estimating significant increases in speed of movement.

(4) The proximity of the tropical cyclone to other tropical cyclones is closely evaluated to determine if there is a possibility of a Fujiwhara interaction (the apparent rotation of two or more cyclones about a common axis or axes).

A final check is made against climatology to determine whether the forecast track is reasonable. If the forecast deviates greatly from one of the climatological tracks, the forecast rationale may be reappraised.

c. INTENSITY FORECASTING:

In this parameter, heavy reliance is placed on intensity trends from aircraft reconnaissance reports, wind and pressure data from ships and land stations in the vicinity of the tropical cyclone, the Dvorak satellite interpretation model and other objective techniques. An evaluation of the entire synoptic situation is made, including the location of major troughs and ridges, the position and intensity of any nearby tropical upper-tropospheric troughs (TUTT), the vertical and horizontal extent of the tropical cyclone's circulation and the extent of the associated upper-level outflow pattern. An essential element affecting each intensity forecast is the accompanying forecast track and the influence of environmental parameters along that track, such as: sea thermal fronts, terrain influences, vertical wind shear, and an extratropical environment.

Once the forecast intensities have been derived, the horizontal distribution of destructive winds (greater than 30-, 50- and 100-knots) is determined. The most recent wind radii and associated asymmetries are deduced from all available surface wind observations and reconnaissance aircraft reports. Based on the current wind distribution, preliminary estimates of future wind radii are provided by an empirically derived objective technique. These estimates may be subjectively modified based on the anticipated interaction of the tropical cyclone's circulation with forecast locations of large-scale wind regimes and significant landmasses. Other factors including the tropical cyclone's speed of movement and possible extratropical transition are considered.

7. WARNINGS

Tropical cyclone warnings are issued when a definite closed circulation is evident and maximum sustained surface winds are forecast to increase to 34 knots (18 meters per second) within 48 hours, or if the tropical cyclone is in such a position that life or property may be endangered within 72 hours. Warnings may also be issued in other situations if it is determined that there is a need to alert military or civil interests to conditions which may become hazardous in a short period of time.

Each tropical cyclone warning is numbered sequentially and includes the following information: the position of the surface center; estimate of the position accuracy and the supporting reconnaissance (fix) platforms; the direction and speed of movement in the past six hours; the intensity and radial extent of surface winds over 30-, 50-, and 100-knots, when applicable. At forecast intervals of 12-, 24-, 48- and 72-hours, information on the tropical cyclone's anticipated position, intensity and wind radii is also provided.

Warnings in the western North Pacific and North Indian Ocean are issued every six hours valid at standard synoptic times (0000Z, 0600Z, 1200Z and 1800Z). All warnings are released to the communications network no earlier than synoptic time and no later than synoptic time plus two and one half hours so that recipients will have a reasonable expectation of having all warnings "in hand" by synoptic time plus three hours (0300Z, 0900Z, 1500Z and 2100Z).

Warning forecast positions are verified against the corresponding "best track" positions (post-storm analysis to determine actual path). A summary of the verification results from 1983 is presented in Chapter IV.

8. PROGNOSTIC REASONING MESSAGES

For tropical storms and typhoons in the western North Pacific Ocean, prognostic reasoning messages are transmitted following the 0000Z and 1200Z warnings, or whenever the previous reasoning is no longer valid. This plain language message is intended to provide meteorologists with the reasoning behind the latest JTWC forecast.

In addition to this message, prognostic reasoning information applicable to all customers is provided in the remarks section of warnings when significant forecast changes are made or when deemed appropriate by the TDO.

9. SIGNIFICANT TROPICAL WEATHER ADVISORY

This product contains a general, non-technical description of all tropical disturbances in the JTWC area of responsibility and an assessment of their potential for further (tropical cyclone) development. In addition, all tropical cyclones in warning status are briefly discussed. This message is issued by 0600Z daily and is reissued whenever the situation warrants.

10. TROPICAL CYCLONE FORMATION ALERT

Formation alerts are issued whenever interpretation of satellite imagery and other meteorological data indicates that the formation of a significant tropical cyclone is likely. These formation alerts will specify a valid period not to exceed 24 hours and must either be cancelled, reissued, or superseded by a tropical cyclone warning prior to the expiration of the valid time.

CHAPTER II - RECONNAISSANCE AND FIXES

1. GENERAL

The Joint Typhoon Warning Center depends on reconnaissance to provide necessary, accurate, and timely meteorological information in support of each warning. JTWC relies primarily on three reconnaissance platforms: aircraft, satellite, and radar. In data rich areas synoptic data are also used to supplement the above. Optimum utilization of all available reconnaissance resources is obtained through the Selective Reconnaissance Program (SRP); various factors are considered in selecting a specific reconnaissance platform including capabilities and limitations, and the tropical cyclone's threat to life/property afloat and ashore. A summary of reconnaissance fixes received during 1983 is included in Section 6 of this Chapter.

2. RECONNAISSANCE AVAILABILITY

a. Aircraft

Aircraft weather reconnaissance in the JTWC area of responsibility is performed by the 54th Weather Reconnaissance Squadron (54th WRS) located at Andersen Air Force Base, Guam. The 54th WRS is presently equipped with six WC-130 aircraft and, from July through October, is augmented by the 53rd WRS from Keesler Air Force Base, Mississippi, bringing the total number of available aircraft to nine. The JTWC reconnaissance requirements, provided daily throughout the year to the Tropical Cyclone Aircraft Reconnaissance Coordinator (TCARC), include system(s) to be fixed, fix times, and forecast positions for each fix. The following priorities are utilized in acquiring meteorological data from reconnaissance aircraft in the western North Pacific area in accordance with USCINCPACINST 3140.1(series):

(1) Investigative flights and vortex or center fixes.

(2) Synoptic data acquisition in support of tropical cyclone warnings.

(3) Supplementary fixes on tropical cyclones.

As in previous years, aircraft reconnaissance provided direct measurements of height, temperature, flight-level winds, sea level pressure, estimated surface wind (when observable), and numerous additional parameters. The meteorological data are gathered by the Aerial Reconnaissance Weather Officers (ARWO) and dropsonde operators of Detachment 4, Hq AWS, who fly with the 54th WRS. These data provide the Typhoon Duty Officer (TDO) with indications of changing tropical cyclone characteristics, radii of associated winds, and current tropical cyclone position and intensity. Another important aspect is the availability of the data for research on tropical cyclone analysis and forecasting.

b. Satellite

Satellite fixes from USAF/USN ground sites and USN ships provide day and night Interpretation of this satellite imagery provides tropical cyclone positions and estimates of current and forecast intensities through the Dvorak technique.

c. Radar

Land radar provides positioning data on well developed tropical cyclones when in the proximity (usually within 175 nm (324 km)) of the radar sites in the Philippines, Taiwan, Hong Kong, Japan, South Korea, Kwajalein, and Guam.

d. Synoptic

In 1983 JTWC also determined tropical cyclone positions based on the analysis of the surface/gradient level synoptic data. These positions were helpful in situations where the vertical structure of the tropical cyclone was weak or accurate surface positions from aircraft were not available due to flight restrictions.

3. AIRCRAFT RECONNAISSANCE SUMMARY

During the 1983 tropical season, the JTWC levied 157 vortex fixes and 53 investigative missions of which 4 were flown into disturbances which did not develop. In addition to the levied fixes, 168 supplemental fixes were also obtained. The average vector error for all aircraft fixes received at the JTWC during 1983 was 13 nm (24 km).

Aircraft reconnaissance effectiveness is summarized in Table 2-1 using the criteria set forth in USCINCPACINST 3140.1 (series).

TABLE 2-1. AIRCRAFT RECONNAISSANCE EFFECTIVENESS

EFFECTIVENESS	NUMBER OF LEVIED FIXES	PERCENT
COMPLETED ON TIME	146	93.0
EARLY	1	0.6
LATE	7	4.5
MISSED	3	1.9
TOTAL	157	100.0

LEVIED VS. MISSED FIXES

	LEVIED	MISSED	PERCENT
AVERAGE 1965-1970	507	10	2.0
1971	802	61	7.6
1972	624	126	20.2
1973	227	13	5.7
1974	358	30	8.4
1975	217	7	3.2
1976	317	11	3.5
1977	203	3	1.5
1978	290	2	0.7
1979	289	14	4.8
1980	213	4	1.9
1981	201	3	1.5
1982	276	17	6.2
1983	157	3	1.9

4. SATELLITE RECONNAISSANCE SUMMARY

The Air Force provides satellite reconnaissance support to JTWC using imagery from a variety of spacecraft. The tropical cyclone satellite surveillance network consists of both tactical and centralized facilities. Tactical DMSP sites are located at Nimitz Hill, Guam; Clark AB, Republic of the Philippines; Kadena AB, Japan; Osan AB, Korea; and Hickam AFB, Hawaii. These sites provide a combined coverage that includes most of the JTWC area of responsibility in the western North Pacific from near the dateline westward to the Malay Peninsula. The Naval Oceanography Command Detachment, Diego Garcia, provides NOAA polar-orbiting coverage in the central Indian Ocean as a supplement to Air Force Global Weather Central (AFGWC) support in this data sparse region. U.S. Navy ships equipped for direct readout also provide supplementary support.

AFGWC, located at Offutt AFB, Nebraska, is the centralized member of the tropical cyclone satellite surveillance network. In support to JTWC, AFGWC processes stored imagery from DMSP and NOAA spacecraft. Imagery processed at AFGWC is recorded on-board the spacecraft as it passes over the earth. Later, these data are downlinked to AFGWC via a network of command/readout sites and communications satellites. This enables AFGWC to obtain the coverage necessary to fix all tropical systems of interest to JTWC. AFGWC has the primary responsibility to provide tropical cyclone surveillance over the entire Indian Ocean and portions of the western North Pacific on both sides of the dateline. Additionally, AFGWC can be tasked to provide tropical cyclone positions in the western North Pacific and South Pacific as backup to coverage routinely available in those regions.

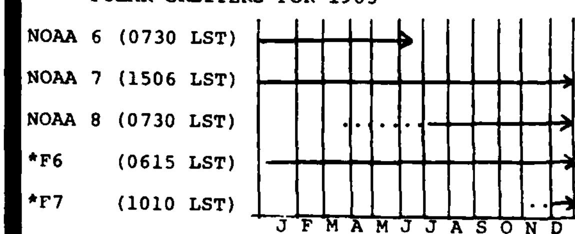
The hub of the network is Det 1. 1WW, colocated with JTWC on Nimitz Hill, Guam. Based on available satellite coverage, Det 1 coordinates satellite reconnaissance requirements with JTWC and tasks the individual network sites for the necessary tropical cyclone fixes. Therefore, when a position from a polar-orbiting satellite is required as the basis for a warning, called a "levied fix", a dual-site tasking concept is applied. Under this concept, two sites are tasked to fix the tropical cyclone from the same satellite pass. This provides the necessary redundancy to virtually guarantee JTWC a successful satellite fix on the tropical cyclone. Using this dual-site concept, the satellite reconnaissance network is capable of meeting all of JTWC's levied satellite fix requirements.

The network provides JTWC with several products and services. The main service is one of surveillance. Each site reviews its daily satellite coverage for indications of tropical cyclone development. If an area exhibits the potential for development, JTWC is notified. Once JTWC issues either a formation alert or warning, the network is tasked to provide three products: tropical cyclone positions, intensity estimates, and 24-hour intensity forecasts. Satellite tropical cyclone positions are assigned position code numbers (PCN) depending on the availability of geography for precise gridding, and the degree of organization of the tropical cyclone's cloud system (Table 2-2). During 1983, the network provided JTWC with a total of 1755 satellite fixes on tropical systems in the western North Pacific. Another 70 were made for tropical systems in the North Indian Ocean. A comparison of those fixes made on numbered tropical cyclones in the western North Pacific with their corresponding JTWC best track positions is shown in Table 2-3. Estimates of the tropical cyclone's current intensity and a 24-hour intensity forecast are made once each day by applying the Dvorak technique (NOAA Technical Memorandum NESDIS 45 as revised) to visual imagery. A similar technique using enhanced infrared imagery is under development.

Three polar orbiters were available throughout the season. Figure 2-1 shows the status of operational polar orbiters. DMSP F-7 became operational in December and should be of benefit in 1984.

Figure 2-1.

POLAR ORBITERS FOR 1983



LST = Local Sun Time
* DMSP Spacecraft
.....Post launch
→ Operational

TABLE 2-2. POSITION CODE NUMBERS

PCN	METHOD OF CENTER DETERMINATION/GRIDDING
1	EYE/GEOGRAPHY
2	EYE/EPHEMERIS
3	WELL DEFINED CC/GEOGRAPHY
4	WELL DEFINED CC/EPHEMERIS
5	POORLY DEFINED CC/GEOGRAPHY
6	POORLY DEFINED CC/EPHEMERIS

CC = Circulation Center

TABLE 2-3. MEAN DEVIATION (NM) OF ALL SATELLITE DERIVED TROPICAL CYCLONE POSITIONS FROM THE JTWC BEST TRACK POSITIONS. NUMBER OF CASES (IN PARENTHESES).

	WESTERN NORTH PACIFIC OCEAN				NORTH INDIAN OCEAN			
	1974-1982 AVERAGE		1983		1980-1982		1983	
PCN	(ALL SITES)		(ALL SITES)		(ALL SITES)		(ALL SITES)	
1	13.5	(537)	13.0	(106)	15.9	(27)	-	(0)
2	12.9	(376)	16.7	(24)	9.0	(4)	-	(0)
3	19.1	(765)	21.6	(167)	25.1	(9)	19.9	(2)
4	18.2	(413)	22.5	(46)	19.1	(3)	24.4	(2)
5	35.8	(1839)	35.3	(218)	32.9	(65)	33.5	(22)
6	36.2	(1049)	32.3	(88)	35.4	(64)	29.6	(19)
1&2	13.3	(913)	13.7	(130)	15.0	(31)	-	(0)
3&4	18.9	(1179)	21.8	(213)	23.6	(12)	22.2	(4)
5&6	36.0	(2888)	34.4	(306)	34.1	(129)	31.7	(41)

5. RADAR RECONNAISSANCE SUMMARY

Fourteen of the 25 significant tropical cyclones in the western North Pacific during 1983 passed within range of land based radars with sufficient cloud pattern organization to be fixed. The land radar fixes that were obtained and transmitted to JTWC totaled 359.

The WMO radar code defines three categories of accuracy: good (within 10 km (5 nm)), fair (within 10 to 30 km (5 to 16 nm)), and poor (within 30 to 50 km (16 to 23 nm)). This year, 359 radar fixes were coded in this manner; 179 were good, 122 fair, and 58 poor. Compared to the JTWC best track, the mean vector deviation for land radar sites was 17 nm (32 km). Excellent support through timely and accurate radar fix positioning allowed JTWC to track and forecast tropical cyclone movement through even the most difficult and erratic tracks.

As in previous years, no radar reports were received on North Indian Ocean tropical cyclones.

6. TROPICAL CYCLONE FIX DATA

A total of 2541 fixes on 25 western North Pacific tropical cyclone and 70 fixes on three North India. Ocean tropical cyclones were received at JTWC. Table 2-4, Fix Platform Summary, delineates the number of fixes per platform for each individual tropical cyclone. Season totals and percentages are also indicated.

Annex A includes individual fix data for each tropical cyclone. Fix data are divided into four categories: Satellite, Aircraft, Radar, and Synoptic. Those fixes labelled with an asterisk (*) were determined to be unrepresentative of the surface center and were not used in determining the best tracks. Within each category, the first three columns are as follows:

FIX NO. - Sequential fix number

TIME (Z) - GMT time in day, hours and minutes

FIX POSITION - Latitude and longitude to the nearest tenth of a degree

Depending upon the category, the remainder of the format varies as follows:

a. Satellite

(1) ACCRY - Position Code Number (PCN) is used to indicate the accuracy of the fix positon. A "1" indicates relatively high accuracy and a "6" relatively low accuracy.

(2) DVORAK CODE - Intensity evaluation and trend (Figure 2-2, Table 2-5). (For specifics, refer to NOAA TM; NESDIS-45).

(3) COMMENTS - For explanation of abbreviations, see Appendix I.

(4) SITE - ICAO call sign of the specific satellite tracking station.

b. Aircraft

(1) FLT LVL - The constant pressure surface level, in millibars or altitude, in feet, maintained during the penetration. The normal level flow in developed tropical cyclones, due to turbulence factors, is 700 mb. Low-level missions are normally flown at 1500 ft (457 m).

(2) 700 MB HGT - Minimum height of the 700 mb pressure surface within the vortex recorded in meters.

(3) OBS MSLP - If the surface center can be visually detected (e.g., in the eye), the minimum sea level pressure is obtained by a dropsonde release above the surface vortex center. If the fix is made at the 1500-foot level, the sea level pressure is extrapolated from that level.

(4) MAX-SFC-WND - The maximum surface wind (knots) is an estimate made by the ARWO based on sea state. This observation is limited to the region of the flight path and may not be representative of the entire tropical cyclone. Availability of data is also dependent upon the absence of

TABLE 2-4. FIX PLATFORM SUMMARY FOR 1983

FIX PLATFORM SUMMARY

WESTERN NORTH PACIFIC	AIRCRAFT	SATELLITE	RADAR	SYNOPTIC	TOTAL
TS SARAH (01W)	--	49	--	--	49
TY TIP (02W)	5	54	3	4	66
TY VERA (03W)	10	103	68	4	185
STY WAYNE (04W)	12	54	18	2	86
STY ABBY (05W)	47	184	44	--	275
TS CARMEN (06W)	10	55	9	--	74
TS BEN (07W)	11	29	6	2	48
TS DOM (08W)	20	82	--	--	102
TD 09W (09W)	1	20	--	2	23
TY ELLEN (10W)	46	153	85	3	287
TC 02C (02C)	--	22	--	--	22
STY FORREST (11W)	25	127	66	5	223
TS GEORGIA (12W)	2	43	4	1	50
TS HERBERT (13W)	1	47	--	--	48
TY IDA (14W)	13	57	36	--	106
TY JOE (15W)	6	60	32	3	101
TS KIM (16W)	--	65	4	--	69
TY LEX (17W)	2	96	11	--	109
STY MARGE (18W)	27	96	--	--	123
TS NORRIS (19W)	6	29	--	1	36
TY ORCHID (20W)	37	94	48	--	179
TY PERCY (21W)	14	72	--	--	86
TS RUTH (22W)	16	77	--	--	93
TS SPERRY (23W)	8	43	--	--	51
TS THELMA (24W)	6	44	--	--	50
TOTAL	325	1755	434	27	2542
% OF TOTAL NR OF FIXES	12.8	69.1	17.1	1.0	100.0

INDIAN OCEAN	SATELLITE	SYNOPTIC	TOTAL
TC 01A	7	--	7
TC 02B	23	--	23
TC 03B	40	--	40
TOTAL	70	--	70
% OF TOTAL NR OF FIXES	100.0	--	100.0

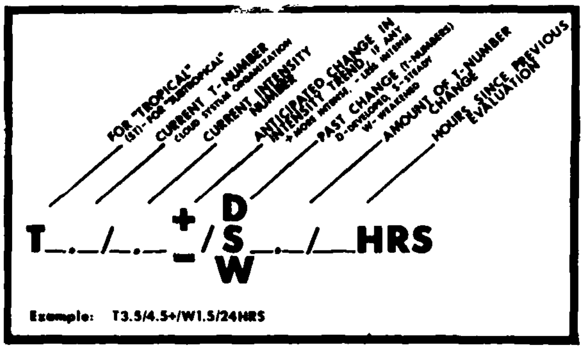


Figure 2-2. The current T-number is 3.5 but the current intensity estimate is 4.5 (equivalent to 77 kt). The cloud system has weakened by 1.5 T-numbers since the previous evaluation conducted 24 hours earlier. The plus (+) symbol indicates an expected reversal of the weakening trend or very little further weakening of the tropical cyclone during the next 24-hour period.

TABLE 2-5. MAXIMUM SUSTAINED WIND SPEED (KT) AS A FUNCTION OF DVORAK CI & FI (CURRENT & FORECAST INTENSITY) NUMBER AND MINIMUM SEA LEVEL PRESSURE (MSLP)

TROPICAL CYCLONE INTENSITY NUMBER	WIND SPEED	MSLP (NW PACIFIC)
1.0	25	--
1.5	25	--
2.0	30	1003
2.5	35	999
3.0	45	994
3.5	55	988
4.0	65	981
4.5	77	973
5.0	90	964
5.5	102	954
6.0	115	942
6.5	127	929
7.0	140	915
7.5	155	900
8.0	170	884

undercast conditions and the presence of adequate illumination. The positions of the maximum flight level wind and the maximum observed surface wind do not necessarily coincide.

(5) MAX-FLT-LVL-WND - Wind speed (knots) at flight level is measured by the AN/APN 147 doppler radar system aboard the WC-130 aircraft. This measurement may not represent the maximum flight level wind associated with the tropical cyclone because the aircraft only samples those portions of the tropical cyclone along the flight path. In many instances, the flight path is through the weak sector of the tropical cyclone. In areas of heavy rainfall, the doppler radar may track energy reflected from precipitation rather than from the sea surface, thus, preventing accurate wind speed measurement. In obvious cases, such erroneous wind data will not be reported. In addition, the doppler radar system on the WC-130 restricts wind measurements to drift angles less than or equal to 27 degrees if the wind is normal (perpendicular) to the aircraft heading.

(6) ACCRY - Fix position accuracy. Both navigational (OMEGA and LORAN) and meteorological (by the ARWO) estimates are given in nautical miles.

(7) EYE SHAPE - Geometrical representation of the eye based on the aircraft radar presentation. The eye shape is reported only if the center is 50 percent or more surrounded by wall cloud.

(8) EYE DIAM/ORIENTATION - Diameter of the eye in nautical miles. When an elliptical eye is present, the lengths of the major and minor axes and the orientation of the major axis are respectively listed. When concentric eye walls are present, each diameter is listed.

c. Radar

(1) RADAR - Specific type of platform (land, aircraft, or ship) utilized for fix.

(2) ACCRY - Accuracy of fix position (good, fair, or poor) as given in the WMO ground radar weather observation code (FM20-V).

(3) EYE SHAPE - Geometrical representation of the eye given in plain language (circular, elliptical, etc.).

(4) EYE DIAM - Diameter of eye given in kilometers.

(5) RADOB CODE - Taken directly from WMO ground weather radar observation code FM20-V. The first group specifies the vortex parameters, while the second group describes the movement of the vortex center.

(6) RADAR POSITION - Latitude and longitude of tracking station given in tenths of a degree.

(7) SITE - WMO station number of the specific tracking station.

CHAPTER III - SUMMARY OF TROPICAL CYCLONES

1. WESTERN NORTH PACIFIC TROPICAL CYCLONES

During 1983, the western North Pacific experienced the fifth consecutive year of below average tropical cyclone activity. Twenty-five tropical cyclones occurred in 1983, six and one-half less than the annual average. Only two significant tropical cyclones failed to develop beyond the tropical depression (TD) stage and eleven tropical storms (TS) failed to reach typhoon intensity. Of the 12 tropical cyclones that developed to typhoon (TY) intensity, four reached the 130 kt (67 m/s) intensity necessary to be classified as super typhoons (STY). In the western North Pacific, tropical cyclones reaching tropical storm intensity or greater are assigned names in alphabetical order from a list of alternating male/female names (refer to Appendix 3). Table 3-1 provides a summary of key statistics for western North Pacific tropical cyclones. Each tropical cyclone's maximum surface wind (in knots) and minimum observed sea level pressure (in millibars) were obtained from best estimates based on all available data. The distance traveled (in nautical miles) was calculated from the JTWC official best tracks (see Annex A).

Tables 3-2 through 3-5 provide further information on the monthly distribution of tropical cyclones and statistics on Tropical Cyclone Formation Alerts and Warnings.

TABLE 3-1. WESTERN NORTH PACIFIC

1983 SIGNIFICANT TROPICAL CYCLONES

TROPICAL CYCLONE	PERIOD OF WARNING	CALENDAR DAYS OF WARNING	NUMBER OF WARNINGS ISSUED	MAXIMUM SURFACE WINDS (KT)	OBSERVED MSLP (MB)	BEST TRACK DISTANCE TRAVELED (NM)
01W TS SARAH	24 JUN - 26 JUN	3	6	35	999	1948
02C TC 02C	31 AUG - 2 SEP	3	5	30	1010	773
02W TY TIP	10 JUL - 13 JUL	4	14	65	978	1206
03W TY VERA	12 JUL - 18 JUL	7	25	90	952	2546
04W STY WAYNE	22 JUL - 25 JUL	4	14	135	920	1739
05W STY ABBY	5 AUG - 17 AUG	13	51	145	888	2031
06W TS CARMEN	12 AUG - 15 AUG	4	11	45	992	1186
07W TS BEN	12 AUG - 15 AUG	4	12	50	989	968
08W TS DOM	19 AUG - 26 AUG	8	23	55	995	1859
09W TD 09W	26 AUG - 27 AUG	2	4	30	996	522
10W TY ELLEN	29 AUG - 9 SEP	12	47	125	928	4462
11W STY FORREST	20 SEP - 29 SEP	10	32	150	883	2191
12W TS GEORGIA	29 SEP - 1 OCT	3	11	55	987	825
13W TS HERBERT	7 OCT - 8 OCT	2	8	50	987	445
14W TY IDA	7 OCT - 11 OCT	5	15	65	973	1889
15W TY JOE	10 OCT - 13 OCT	4	15	65	975	1654
16W TS KIM	16 OCT - 20 OCT	5	3	40	993	1224
17W TY LEX	22 OCT - 26 OCT	5	18	70	971	718
18W STY MARGE	31 OCT - 7 NOV	8	27	145	896	2370
19W TS NORRIS	9 NOV - 11 NOV	3	7	50	994	721
20W TY ORCHID	17 NOV - 27 NOV	11	38	125	928	2214
21W TY PERCY	19 NOV - 24 NOV	6	23	70	970	1123
22W TS RUTH	23 NOV - 30 NOV	8	16	60	993	1615
23W TS SPERRY	2 DEC - 5 DEC	4	10	55	996	350
24W TS THELMA	16 DEC - 18 DEC	3	10	55	990	1165
	1983 TOTALS:	111*	445			

* OVERLAPPING DAYS INCLUDED ONLY ONCE IN SUM

TABLE 3-2.

1983 SIGNIFICANT TROPICAL CYCLONES

WESTERN NORTH PACIFIC

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	(1959-1982) AVERAGE	CASES
TROPICAL DEPRESSIONS	0	0	0	0	0	0	0	2	0	0	0	0	2	3.9	93
TROPICAL STORMS	0	0	0	0	0	1	0	3	1	2	2	2	11	9.7	232
TYPHOONS	0	0	0	0	0	0	3	2	1	4	2	0	12	17.8	428
ALL TROPICAL CYCLONES	0	0	0	0	0	1	3	7	2	6	4	2	25	31.4	753
1959-1982														PREVIOUS	
AVERAGE	.5	.3	.8	.9	1.4	2.0	5.0	6.2	5.9	4.4	2.6	1.4	31.4	24-YEAR	
CASES	13	8	18	22	33	48	119	149	142	105	63	33	753	HISTORY	

FORMATION ALERTS: 25 of 31 Formation Alerts developed into significant tropical cyclones. Tropical Cyclone Formation Alerts were issued for all significant tropical cyclones that developed during 1983.

WARNINGS:

Number of warning days: 111

Number of warning days with two tropical cyclones in region: 18

Number of warning days with three or more tropical cyclones in region: 6

TABLE 3-3.

FREQUENCY OF TYPHOONS BY MONTH AND YEAR

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(1945-1958) AVERAGE	.4	.1	.3	.4	.7	1.1	2.0	2.9	3.2	2.4	2.0	.9	16.3
1959	0	0	0	1	0	0	1	5	3	3	2	2	17
1960	0	0	0	1	0	2	2	8	0	4	1	1	19
1961	0	0	1	0	2	1	3	3	5	3	1	1	20
1962	0	0	0	1	2	0	5	7	2	4	3	0	24
1963	0	0	0	1	1	2	3	3	3	4	0	2	19
1964	0	0	0	0	2	2	6	3	5	3	4	1	26
1965	1	0	0	1	2	2	4	3	5	2	1	0	21
1966	0	0	0	1	2	1	3	6	4	2	0	1	20
1967	0	0	1	1	0	1	3	4	4	3	3	0	20
1968	0	0	0	1	1	1	1	4	3	5	4	0	20
1969	1	0	0	1	0	0	2	3	2	3	1	0	13
1970	0	1	0	0	0	1	0	4	2	3	1	0	12
1971	0	0	0	3	1	2	6	3	5	3	1	0	24
1972	1	0	0	0	1	1	4	4	3	4	2	2	22
1973	0	0	0	0	0	0	4	2	2	4	0	0	12
1974	0	0	0	0	1	2	1	2	3	4	2	0	14
1975	1	0	0	0	0	0	1	3	4	3	2	0	15
1976	1	0	0	1	2	2	2	1	4	1	1	0	15
1977	0	0	0	0	0	0	3	0	2	3	2	1	11
1978	0	0	0	1	0	0	3	2	4	3	2	0	15
1979	1	0	1	1	0	0	2	2	3	2	1	1	14
1980	0	0	0	0	2	0	3	2	5	2	1	0	15
1981	0	0	1	0	0	2	2	2	4	1	2	2	16
1982	0	0	2	0	1	1	2	5	3	3	1	1	19
1983	0	0	0	0	0	0	3	2	1	4	2	0	12
(1959-1983) AVERAGE	.2	.04	.2	.6	.8	.9	2.8	3.3	3.2	3.0	1.6	.6	17.4
CASES	6	1	6	15	20	23	69	83	81	76	40	15	435

TABLE 3-4.

FREQUENCY OF TROPICAL STORMS AND TYPHOONS BY MONTH AND YEAR

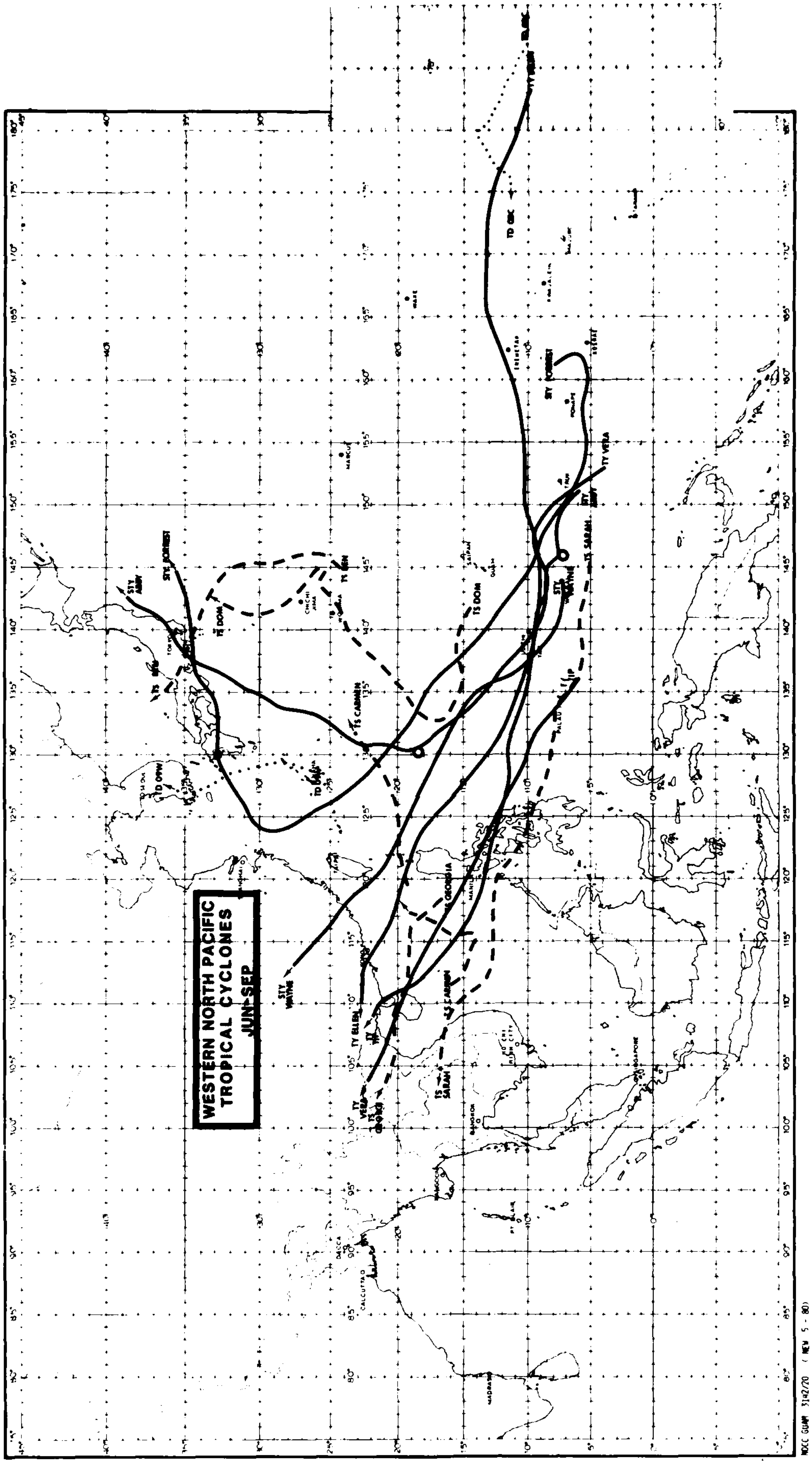
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(1945-1958) AVERAGE	.4	.1	.4	.5	.8	1.3	3.0	3.9	4.1	3.3	2.7	1.1	21.6
1959	0	1	1	1	0	0	3	6	6	4	2	2	26
1960	0	0	0	1	1	3	3	10	3	4	1	1	27
1961	1	1	1	1	3	2	5	4	6	5	1	1	31
1962	0	1	0	1	2	0	6	7	3	5	3	2	30
1963	0	0	0	1	1	3	4	3	5	5	0	3	25
1964	0	0	0	0	2	2	7	9	7	6	6	1	40
1965	2	2	1	1	2	3	5	6	7	2	2	1	34
1966	0	0	0	1	2	1	5	8	7	3	2	1	30
1967	1	0	2	1	1	1	6	8	7	4	3	1	35
1968	0	0	0	1	1	1	3	8	3	6	4	0	27
1969	1	0	1	1	0	0	3	4	3	3	2	1	19
1970	0	1	0	0	0	2	2	6	4	5	4	0	24
1971	1	0	1	3	4	2	8	4	6	4	2	0	35
1972	1	0	0	0	1	3	6	5	4	5	2	3	30
1973	0	0	0	0	0	0	7	5	2	4	3	0	21
1974	1	0	1	1	1	4	4	5	5	4	4	2	32
1975	1	0	0	0	0	0	2	4	5	5	3	0	20
1976	1	1	0	2	2	2	4	4	5	1	1	2	25
1977	0	0	1	0	0	1	4	1	5	4	2	1	19
1978	1	0	0	1	0	3	4	7	5	4	3	0	28
1979	1	0	1	1	1	0	4	2	7	3	2	2	24
1980	0	0	0	1	4	1	4	2	6	4	1	1	24
1981	0	0	1	2	0	2	5	7	4	2	3	2	28
1982	0	0	3	0	1	3	4	5	5	3	1	1	26
1983	0	0	0	0	0	1	3	5	2	5	5	2	23
(1959-1983) AVERAGE	.5	.3	.6	.8	1.2	1.6	4.4	5.4	4.9	4.0	2.5	1.2	27.3
CASES	12	7	14	21	29	40	111	135	122	100	62	30	683

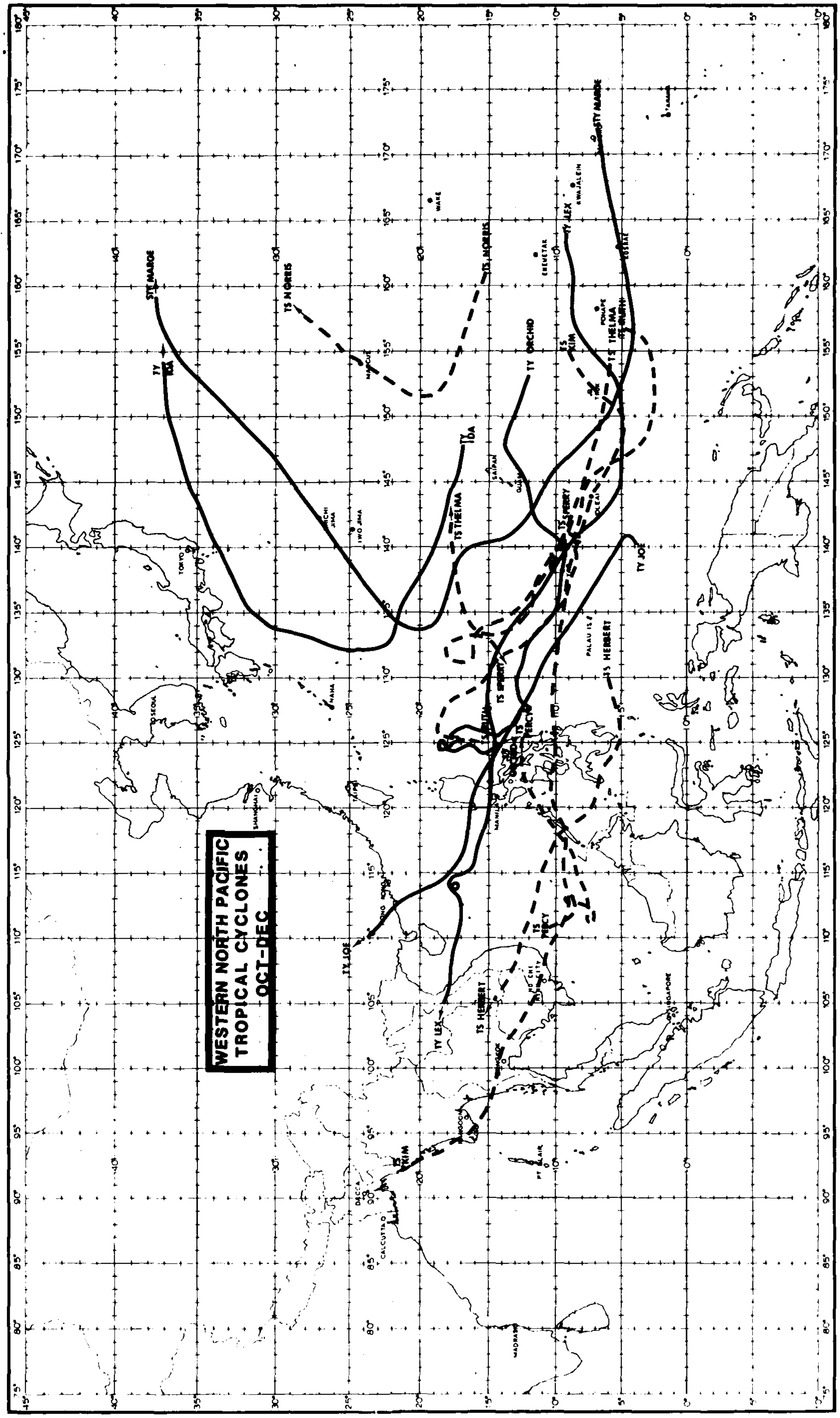
TABLE 3-5.

FORMATION ALERT SUMMARY

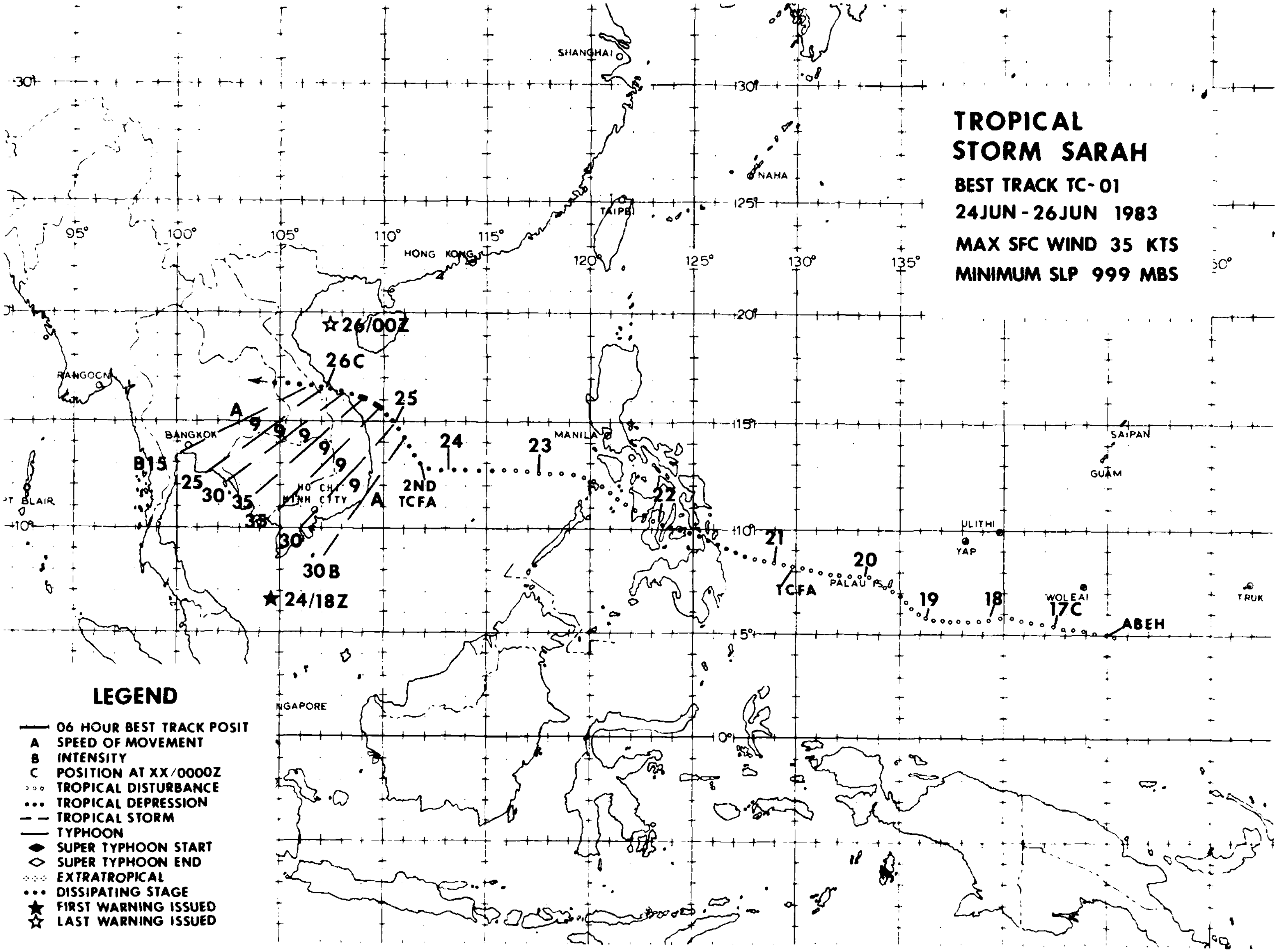
WESTERN NORTH PACIFIC

YEAR	NUMBER OF ALERT SYSTEMS	ALERT SYSTEMS WHICH BECAME NUMBERED TROPICAL CYCLONES	TOTAL NUMBERED TROPICAL CYCLONES	DEVELOPMENT RATE
1972	41	29	32	71%
1973	26	22	23	85%
1974	35	30	36	86%
1975	34	25	25	74%
1976	34	25	25	74%
1977	26	20	21	77%
1978	32	27	32	84%
1979	27	23	28	85%
1980	37	28	28	76%
1981	29	28	29	97%
1982	36	26	28	72%
1983	31	25	25	81%
(1972-1983) AVERAGE	32.3	25.7	27.7	80%
CASES	388	308	332	


WESTERN NORTH PACIFIC
TROPICAL CYCLONES
JUN-SEP
NOCC GUAM 3142/20 (REV 5 - 80)



WESTERN NORTH PACIFIC
TROPICAL CYCLONES
OCT-DEC
STY MARGE
TY REX
TS NORRIS
TY IDA
TS THELMA
TY ORCHID
TY LEX
TS KIM
TY JOE
TS SPERRY
TS HERBERT
TS PERCY
TOKYO
NAHA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
KWAJALEIN
ENEWETAK
PONAPE
KOSRAE
PALAU IS
MANILA
SHANGHAI
SEOUL
HONG KONG
SINGAPORE
CALCUTTA
DACCA
MADRAS
RANGOON
BANGKOK
NOCC GUAM 3142/20 (NEW 5-80)


TROPICAL
STORM SARAH
BEST TRACK TC-01
24JUN-26JUN 1983
MAX SFC WIND 35 KTS
MINIMUM SLP 999 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
RANGOON
HO CHI MINH CITY
PT BLAIR
SINGAPORE
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PALAU
ABEH
17C
18
19
20
TCFA
21
22
23
24
2ND TCFA
25
26C
26/00Z
24/18Z
30B
30
35
25
B15
A
9
95°
100°
105°
110°
115°
120°
125°
130°
135°
30°
25°
20°
15°
10°
5°
0°

The formation of Tropical Storm Sarah in the South China Sea during late June marked the beginning of the 1983 tropical cyclone season for the northwestern Pacific. This was the latest season-opener since 1973 when JTWC issued its first warning of the year in July.

The disturbance that was to eventually spawn Sarah was first detected using satellite imagery on 16 June. It was described on that day in the Significant Tropical Weather Advisory (ABEH PGTW) as a poorly organized area of convection centered near 5N 145E.

An upper-level trough located 600 nm (1111 km) to the northwest contributed to the formation of an area of strong upper-level divergence which appeared to be associated with the convection. As the upper-level trough pushed westward over the next few days, the area of enhanced convection maintained its relative position to the southeast and moved west as well.

It was not until the 19th that a weak surface circulation became apparent from satellite imagery near 6N 136E in the low-level easterly flow. This circulation was located along the southern tip of a narrow band of heavy convection extending northward to near the position of the upper-level trough. As the circulation moved westward, the strongest area of convection remained well to the north. A TCFA was issued at 201930Z when it became apparent from satellite imagery that the convection had become more organized around the circulation and that an upper-level anticyclone had developed over the system. However, the ensuing daylight aircraft investigative mission, at 210025Z found only a weakly defined, 1009 mb surface circulation with winds in excess of 15 kt (8 m/s) observed only in the trade wind flow to the north of the circulation.

Convective activity associated with the circulation persisted and increased sharply as the circulation approached the northern tip of Mindanao. The system was continued in alert status and monitored closely as it crossed the southern Philippines. Synoptic data during this interval indicated the presence of a weak 10-15 kt (5-8 m/s) disturbance which was difficult to track as it crossed the islands. The formation alert was cancelled at 220445Z when satellite imagery indicated that the system had lost its upper-level anticyclone and that its convection had broken up over the mountainous terrain.

Over the next two days the remaining weak surface circulation was observed moving westward into the South China Sea. Convection associated with the circulation was unorganized and strong upper-level northeasterly flow presented a shearing environment that was not considered favorable for further development.

The third, and final, formation alert on this system was issued at 240930Z after convective activity associated with the circulation underwent a marked increase in intensity and organization. Continued intensification, evident from satellite imagery, combined with synoptic reports indicating the presence of 25-30 kt (13-15 m/s) winds, prompted the issuance of the first warning of the 1983 season at 241830Z.

Tropical Storm intensity was reached 12 hours later as Sarah drifted northwestward toward Vietnam. Figure 3-01-1 shows Sarah near maximum intensity off the coast of Vietnam. Further intensification was prevented by intense vertical shear--satellite-derived winds up to 45 kt (23 m/s) over the system--which displaced Sarah's convection to the west.

Under the effects of this hostile shearing environment, Sarah was not able to maintain vertical organization and weakened while approaching the coast of Vietnam. The final warning was issued at 260300Z as Sarah, a fully exposed low-level circulation, moved inland north of Hue and dissipated rapidly.

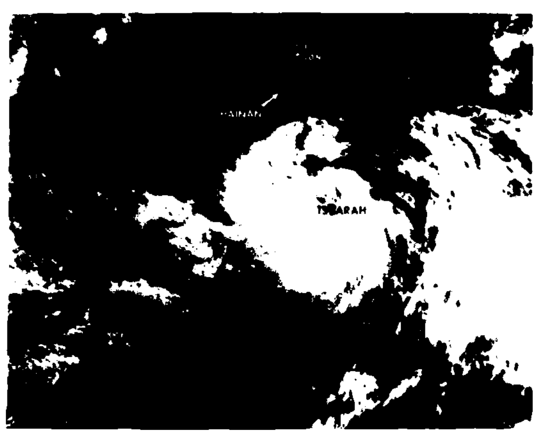
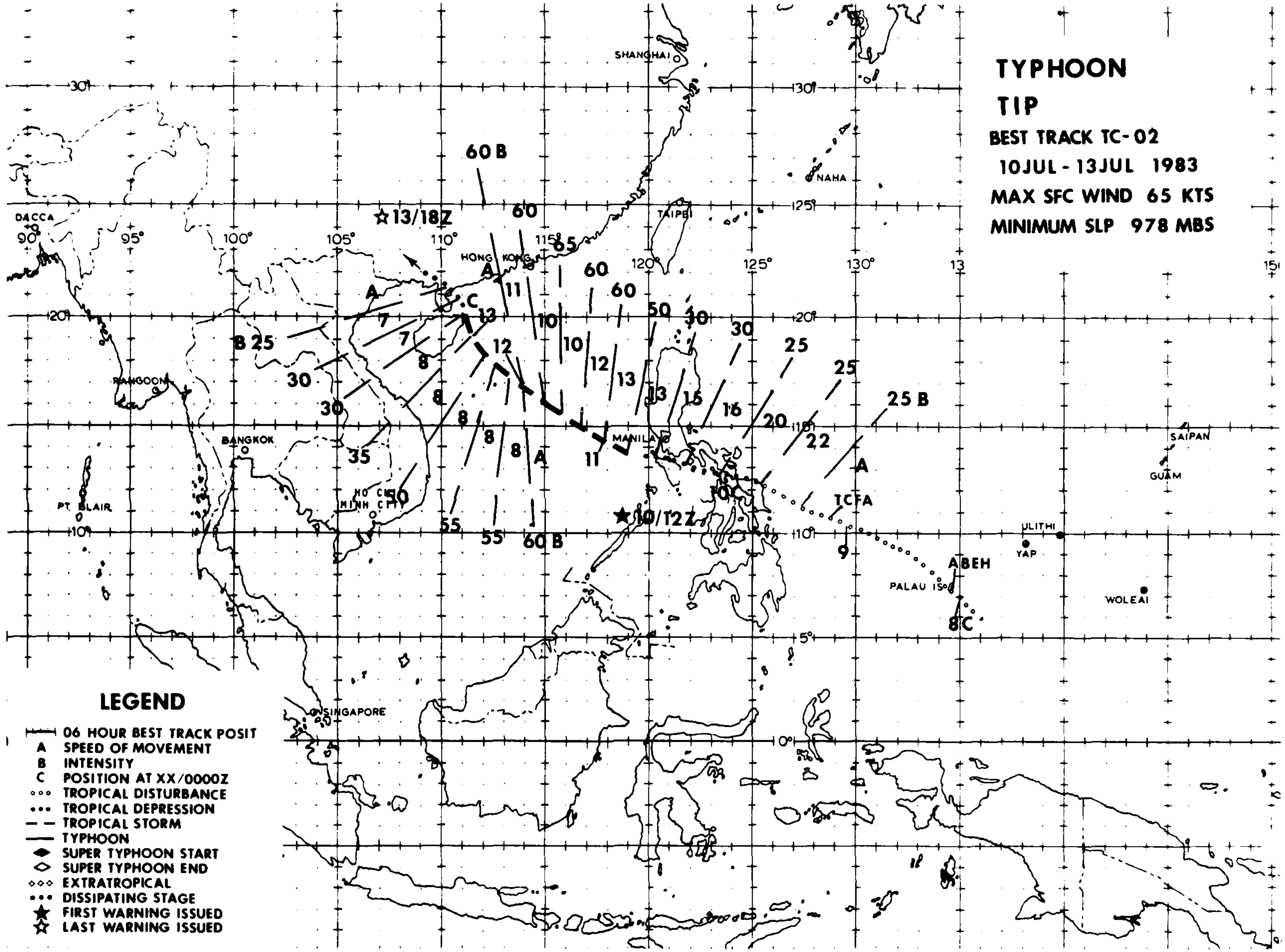


Figure 3-01-1. Tropical Storm Sarah at maximum intensity approaching the coast of Vietnam.


TYPHOON
TIP
BEST TRACK TC-02
10JUL-13JUL 1983
MAX SFC WIND 65 KTS
MINIMUM SLP 978 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
DACCA
RANGOON
BANGKOK
HO CHI MINH CITY
PT. BLAIR
SINGAPORE
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
PALAU IS
TCFA
ABEH
13/18Z
10/12Z

During late June and early July several tropical disturbances were monitored by JTWC. All of these, with the exception of Tropical Storm Sarah (01W), originated in the Philippine Sea and moved westward without developing into significant tropical cyclones. The combination of the rugged Philippine terrain and strong upper-level flow in the South China Sea was sufficient deterrent to development.

On 8 July another disturbance became evident in the Philippine Sea as a persistent area of convective activity near 8N 134 E. Synoptic data indicated that the disturbance was poorly organized with an MSLP of 1008 mb.

On the following day, the disturbance was located near 11N 129E and appeared somewhat more organized on satellite imagery. A weather reconnaissance aircraft on an investigative mission east of Samar was unable to locate a closed circulation, but found a broad area of low presures with maximum surface winds of 25 kt (13 m/s) and MSLP of 1004 mb. In spite of the apparent absence of a well defined surface circulation, a TCFA was issued at 090841Z. The alert was issued because the disturbance was entering an area of strong upper-level divergence associated with a TUTT cell to the northeast. JTWC continued to monitor this disturbance as it moved rapidly across the Philippines, however synoptic data from Philippine land stations indicated that the disturbance remained loosely organized.

The first warning was issued as the disturbance, now tropical depression 02W, entered the South China Sea north of Mindoro. Synoptic data indicated the presence of a well defined surface circulation with 30 kt (15 m/s) winds and MSLP of 998 mb. From the initial warning, movement to the northwest toward Hainan Island was forecast, with continued intensification and then weakening late in the period. This forecast scenario was based on the expectation that the mid-level easterly steering currents and strong vectical shear in the area whould persist through the forecast period.

Tip lived up to expectations, moving as expected and achieving typhoon intensity at 111200Z. Figure 3-02-1 shows Tip near maximum intensity on the 11th. The effects of the strong upper-level flow are apparent as Tip appears as an exposed low-level circulation with its convection displaced to the southwest. The circulation appearing on the right hand side of the picture is the disturbance which later developed into Typhoon Vera (03W). Figure 3-02-2 is the 200 mb analysis for the area at the time of Tip's maximum intensity. Note the strong northeasterly flow over Tip and the divergent area in which Tip formed to the east.

After attaining maximum intensity of 65 kt (33 m/s) on the 11th, Tip continued to move northwestward and weakened as an exposed low-level circulation. Tip made landfall near Chan Chiang, China on the 13th with maximum sustained winds of 30 kt (15 m/s) and dissipated rapidly over land.

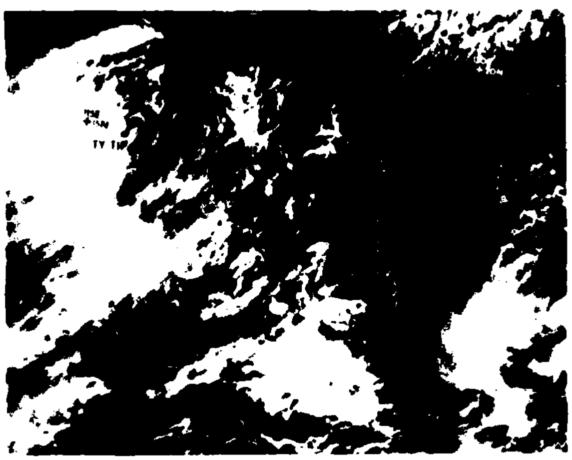


Figure 3-02-1. Typhoon Tip at maximum intensity in the South China Sea. Note the effects of the strong upper-level flow, displacing Tip's convection to the southwest and exposing the low-level circulation. (110644Z NOAA 7 visual imagery).

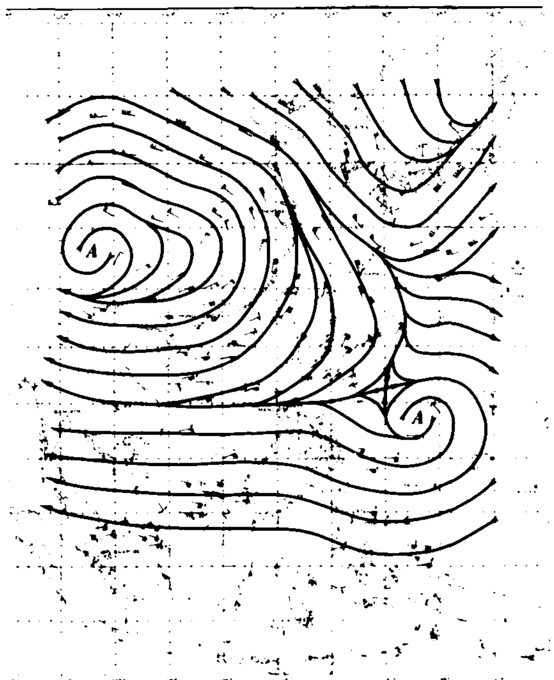
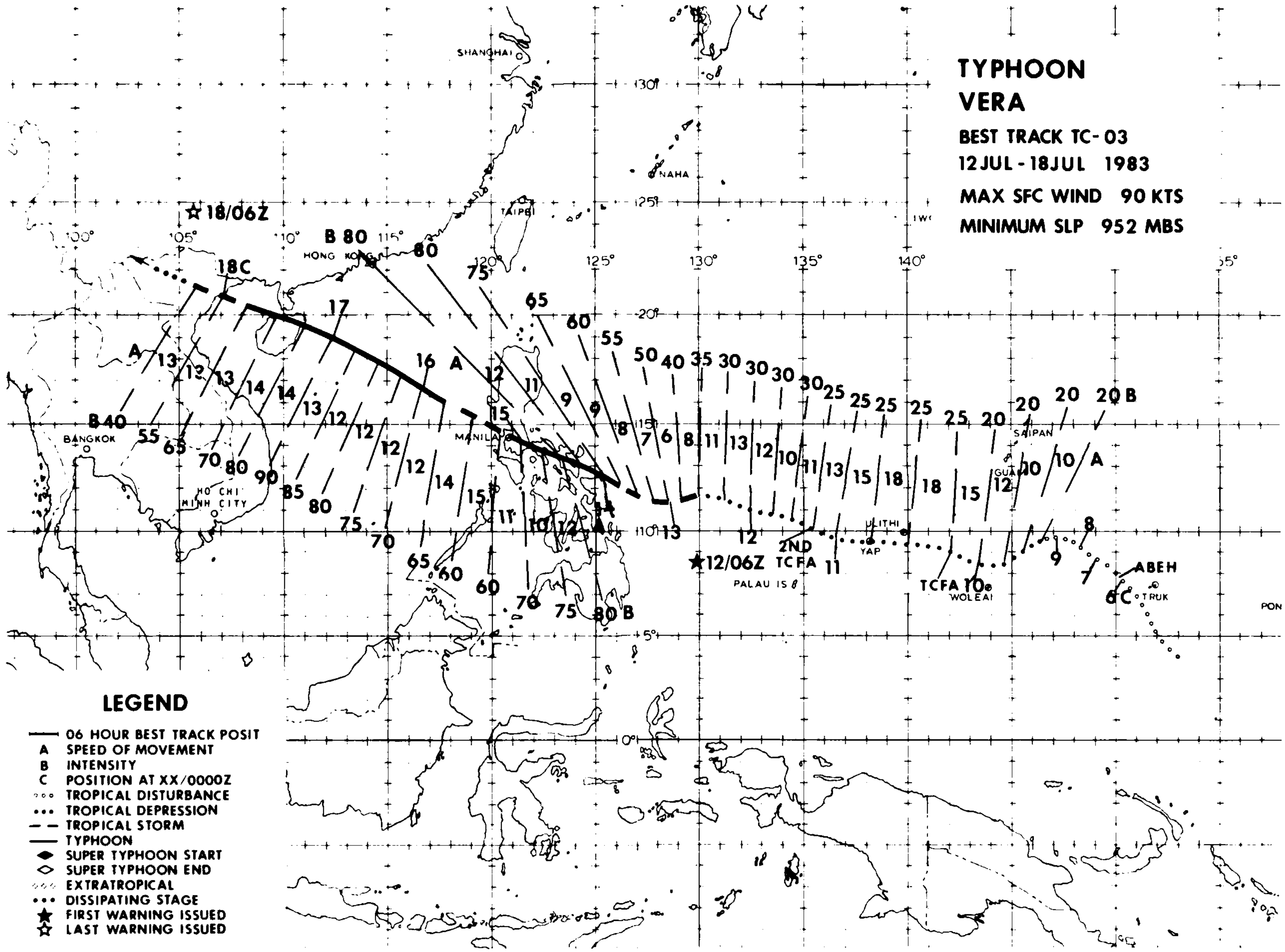


Figure 3-02-2. 111200Z July 200 mb analysis. Note strong northeasterly flow in the South China Sea.


TYPHOON
VERA
BEST TRACK TC-03
12JUL-18JUL 1983
MAX SFC WIND 90 KTS
MINIMUM SLP 952 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
18/06Z
12/06Z
2ND TCFA
TCFA
SHANGHAI
NAHA
TAIPEI
HONG KONG
BANGKOK
HO CHI MINH CITY
MANILA
PALAU IS
YAP
ULITHI
SAIPAN
GUAM
WOLEAI
TRUK
ABEH

In the week that preceded the development of Typhoon Vera, the monsoon trough extended eastward from the Philippines to 160E as a nearly continuous zone of light surface winds and unorganized convection. However, on 4 July, surface westerlies increased to 15 kt (8 m/s) south of the trough and one circulation center, located near Truk Atoll (WMO 91334) became a persistent feature on JTWC gradient-level charts. A noticeable change in convective activity was observed on 8 July, as two distinct cloud masses began to develop within the monsoon trough. This change occurred as two upper-tropospheric cyclones intensified over the Philippine Sea, one east of Luzon about 125E and the other west of Guam about 140E. The upper cyclones increased the upper-level divergence near both convective disturbances and were instrumental in sustaining the development of each during the subsequent three day period. The westernmost disturbance became Typhoon Tip (02W) and the disturbance which moved northwestward from the Truk area became Typhoon Vera.

The first of two TCFAs on Vera was issued at 100600Z, when satellite imagery and 200 mb wind data indicated that a well-defined upper-level circulation had developed over the system. Development of a well-defined surface circulation was slow and the formation alert was reissued at 110600Z after a reconnaissance aircraft investigative mission could not locate a circulation center in the low-level wind field. Figure 3-03-1 shows the suspect disturbance as it appeared on satellite imagery at the time of this reconnaissance mission. Twenty-four hours later, the initial warning was issued for Tropical Depression 03W when data from the next reconnaissance aircraft mission indicated a closed surface circulation with 30 kt (15 m/s) winds and a 1004 mb central sea level pressure.

During the first 36 hours in warning status, Vera intensified quite rapidly and reached typhoon strength by 131800Z. During this period, Vera slowed from an average speed of 12 kt (22 km/hr) to less than 6 kt (11 km/hr). In fact, during one 12-hour period (121200Z to 130000Z), virtually all fix positions were within a 30 nm(56 km) area. On 13 July, Vera turned toward the west-northwest and the central Philippines with the speed of movement increasing to 12 kt (22 km/hr). Vera skirted the northeastern portion of the island of Samar at 140000Z, with maximum sustained surface winds near 75 kt (39 m/s). Figure 3-03-2 shows Typhoon Vera as it entered the Philippines near the island of Samar. Forecasts from this point forward anticipated that Vera would weaken as it tracked through the Philippines. However, satellite imagery continued to indicate an increase in Vera's central cloud features until it reached the rugged terrain east of Manila at 150000Z. Vera then moved into Manila Bay, packing winds near 60 kt (31 m/s), and brought extensive flooding into low-lying areas of the Bay, especially

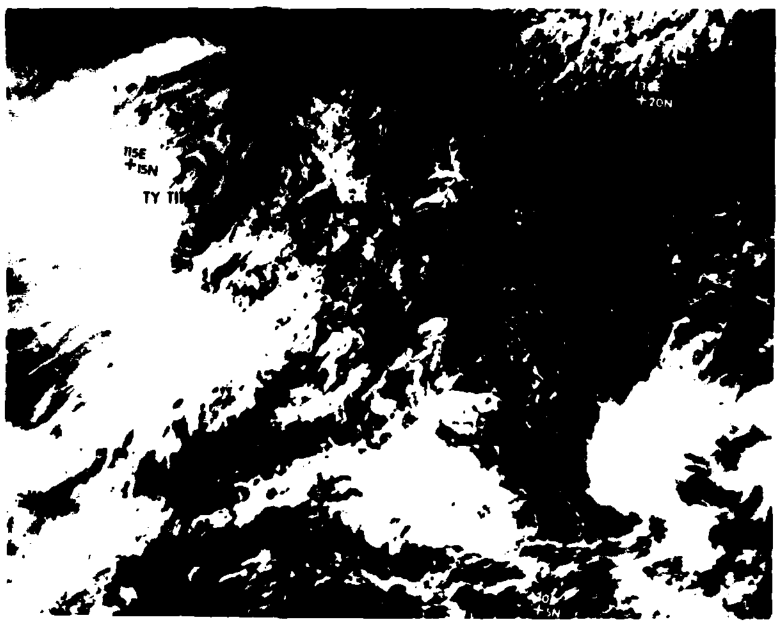


Figure 3-03-1. Typhoon Vera developing 160 nm (296 km) north of Koror at the time that the second formation alert was issued. Typhoon Tip is located to the west in the South China Sea (110644Z NOAA 7 visual imagery).

on Corregidor. Vera passed just southwest of the Naval Air Station, Cubi Point, at 150630Z and into the South China Sea. In its wake, Vera left thousands homeless, nearly 100 people dead and extensive property damage to the southern two-thirds of Luzon.

Track forecasts for Vera were quite good except for an anticipated turn northward as the system moved into the South China Sea. Figure 3-03-3 depicts the 48-hour NOGAPS 700 mb prog valid for 161200Z and the verifying analysis. The significant difference between the prognostic chart and the analysis was the extent and orientation of the subtropical ridge over eastern China. The prognostic fields suggested that a track northward was possible; however, as Vera moved west-northwestward into the South China Sea, the ridge built westward and also became narrower between 20N and 30N. As a result, the forecast northward track never materialized and Vera persisted on its west-northwestward track.

On 17 July, as Vera approached Hai-Nan Island, a peak intensity of 90 kt (46 m/s) was attained. Crossing Hai-Nan and moving into the northern portion of the Gulf of Tonkin, Vera slowly weakened before making landfall near Haiphong, Vietnam, at 180000Z. It then weakened rapidly over the mountainous terrain of northern Vietnam.

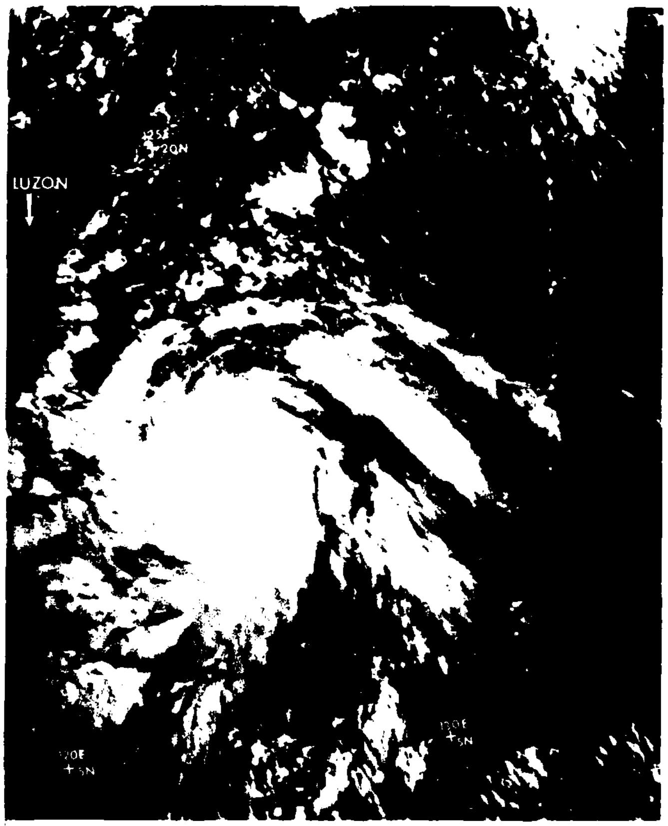
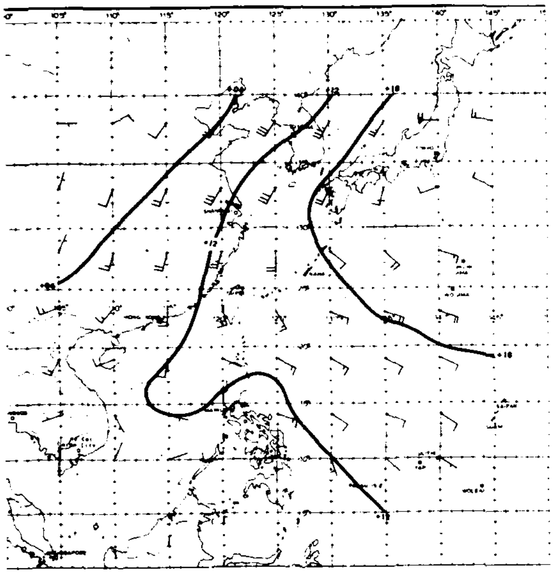
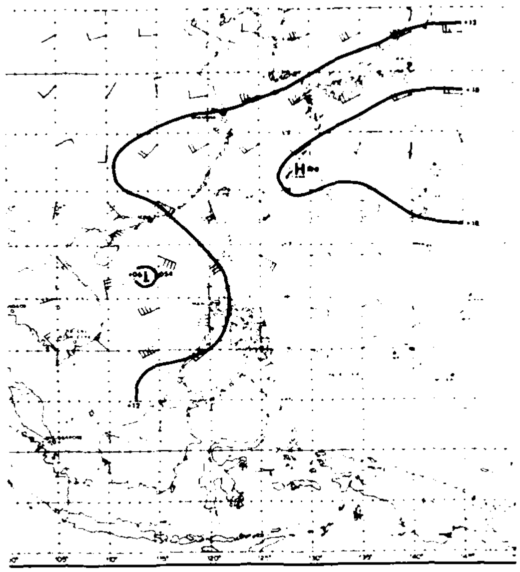


Figure 3-03-2. Typhoon Vera, located just east of Samar, with maximum winds near 70 kt (36 m/s). (132252Z NOAA 8 visual imagery).

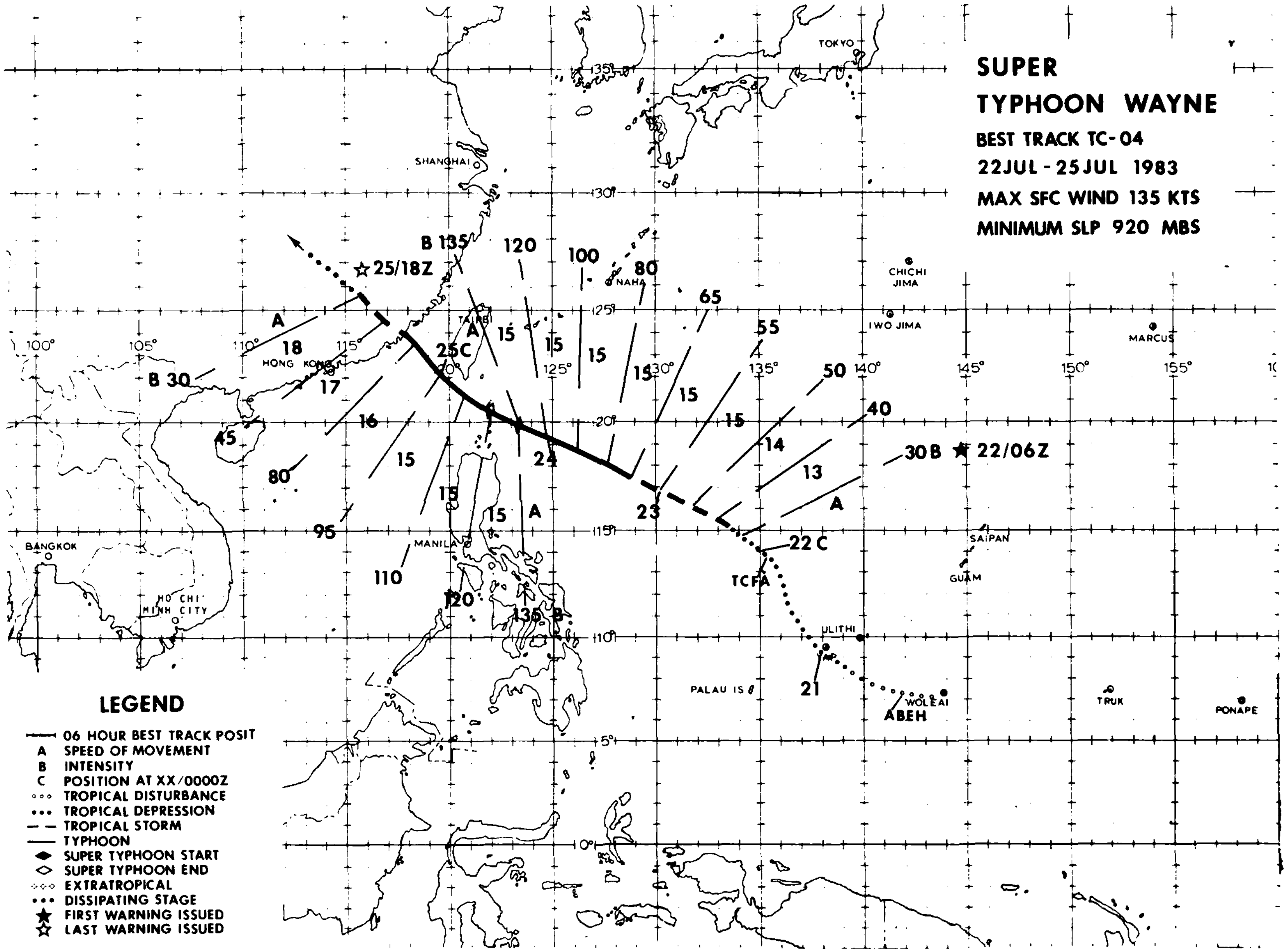


a. 48-HOUR 700mb PROG



b. 700mb ANAL

Figure 3-03-3. NOGAPS 48-hour 700 mb prog (a) and verifying analysis (b) valid for 161200Z. Track forecasts toward southern China were influenced by a series of numerical progs which indicated that a pronounced southerly flow would develop in the middle and lower levels over the South China Sea.


SUPER
TYPHOON WAYNE
BEST TRACK TC-04
22JUL - 25JUL 1983
MAX SFC WIND 135 KTS
MINIMUM SLP 920 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
HO CHI MINH CITY
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
PALAU IS
WOLEAI
TRUK
PONAPE
TCFA
ABEH
25/18Z
22/06Z
B 135
B 30
30 B
22 C
25C

Cyclogenesis of Super Typhoon Wayne began in an elongated east-west surface trough west of Truk (WMO 91334). Initial satellite imagery on 19 July at 1200Z indicated a widespread area of poorly organized convective activity supported by a weak upper-level anticyclone. This area remained poorly developed until 1200Z on the 21st when satellite imagery indicated the development of an upper trough northwest of the system (Figure 3-04-1). This served to support the development of the upper-level anticyclone. Subsequent satellite imagery indicated an increase in the organization and convective activity of the system. Based on this evidence and the potential for further development, a TCFA was issued at 212130Z. Initial aircraft reconnaissance at 220457Z revealed a weak tropical depression with an MSLP of 1005 mb and maximum surface winds of 25 kt (13 m/s). The first warning on Wayne was issued shortly thereafter at 220630Z.

During the next 24 hours, Wayne more than doubled in intensity to 65 kt (32 m/s) and began to track northwestward at 15 kt (26 km/hr). Aircraft reconnaissance at 230830Z reported very high 700 mb heights just prior to entering the eyewall of Wayne, followed by an extremely sharp pressure gradient on penetration to the center of the system. Wayne continued to intensify rapidly, again doubling in intensity over a 24 hour period as it moved westward along the southern periphery of the subtropical ridge. Maximum intensity of 135 kt (67 m/s) occurred at 240600Z only two days after the first warning on the system as a 25 kt (13 m/s) tropical depression.

Wayne's rapid intensification is evident in Figure 3-04-2. Note the generally good agreement between Dvorak intensity estimates and those from reconnaissance aircraft. Figure 3-04-3 shows Wayne near maximum intensity with a wall-developed anticyclone and gravity waves evident in the cloud features near the eye.

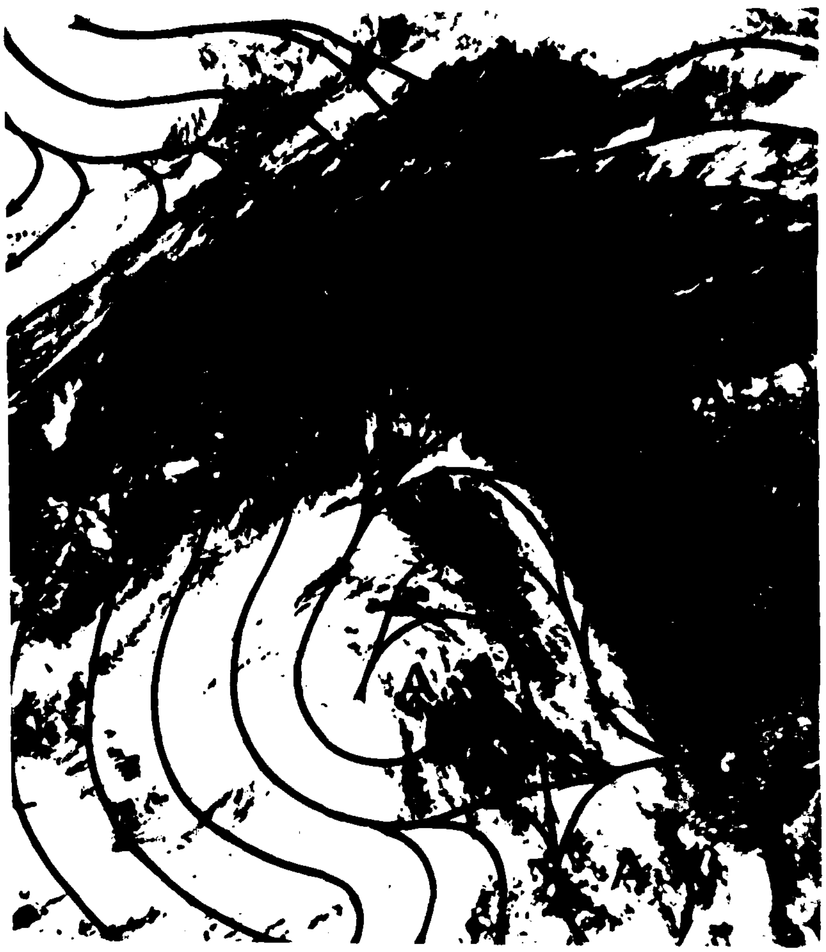


Figure 3-04-1. Overlay of 200 mb analysis with satellite imagery during early stages of development of Super Typhoon Wayne (212039Z July DMSP infrared imagery).

As Super Typhoon Wayne passed north of Luzon, the low-level surface flow was disrupted north of the storm by the topography of Taiwan, setting up a leeside trough in the Formosa Straits. Wayne responded to this trough, taking a more northward track and making landfall approximately 300 nm (556 km) east of Hong Kong (WMO 45005). Wayne struck the coast of China with typhoon strength, but rapidly dissipated as it moved inland over the mountainous terrain of southeastern China.

JTWC was successful in forecasting Wayne's track westward, but encountered problems forecasting speed of movement, which averaged 15 kt (26 km/hr), and intensity, which went from 25 kt (13 m/s) to 135 kt (67 m/s) in just 48 hours. Wayne's rapid intensification was a product of the supportive upper-level conditions which existed throughout its lifetime. Wayne's initial favorable position with respect to upper-level features (5-7 degrees southeast of a TUTT cell), was maintained throughout its westward track resulting in the development of well defined outflow channels to the northeast and southwest.

Although Wayne did not make landfall in the Philippines, high winds and torrential rainfall associated with its peripheral circulation brough destruction to areas far removed from the center. At least twenty people were killed and more than one hundred were reported missing when a bridge collapsed 300 nm (556 km) southeast of Manila (WMO 98426).

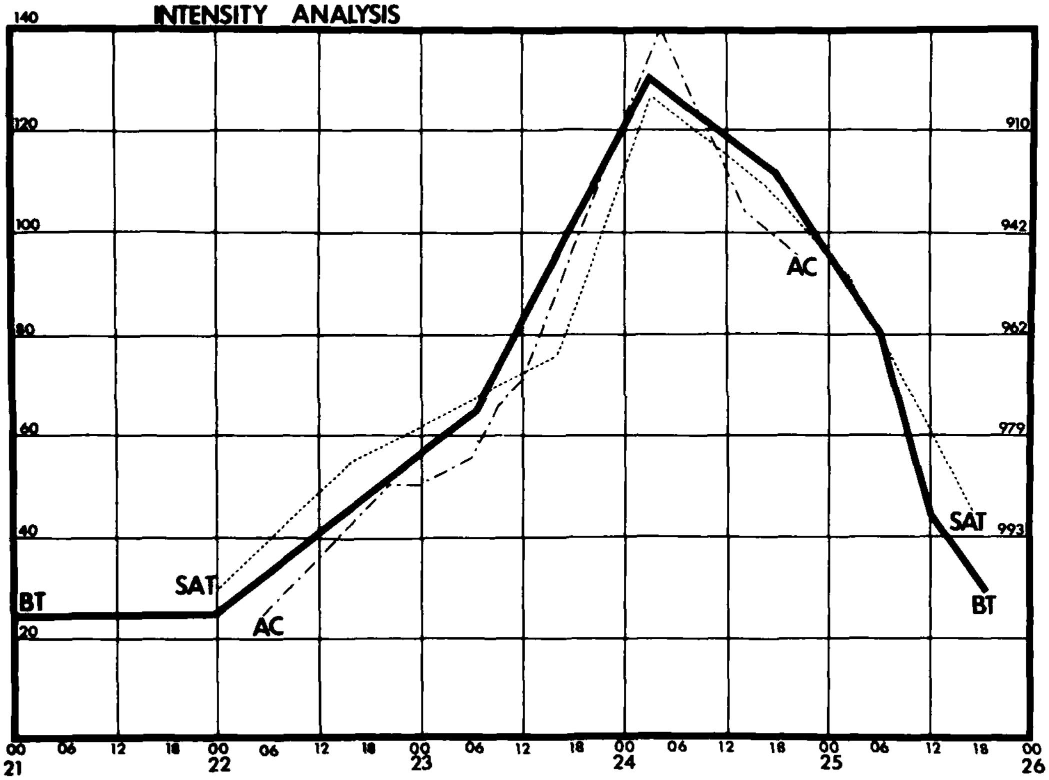
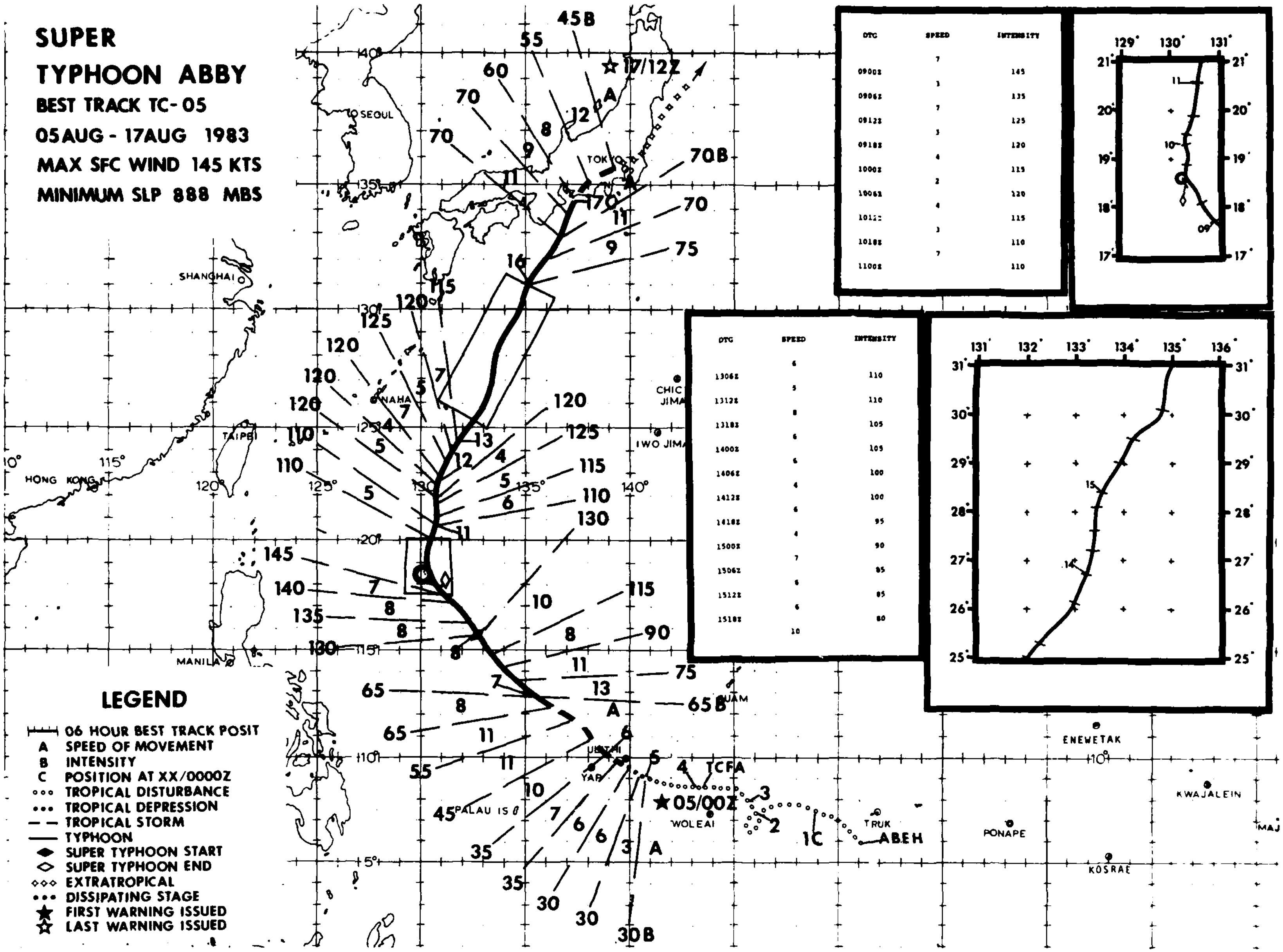


Figure 3-04-2. Satellite intensity estimates (Dvorak, 1973) and intensities measured by reconnaissance aircraft. Best track intensities are represented as a continuous line.

Figure 3-04-3. Super Typhoon Wayne at maximum intensity - 135 kt (67 m/s).


SUPER
TYPHOON ABBY
BEST TRACK TC-05
05AUG - 17AUG 1983
MAX SFC WIND 145 KTS
MINIMUM SLP 888 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
SHANGHAI
TAIPEI
HONG KONG
MANILA
NAHA
TOKYO
CHICHI JIMA
IWO JIMA
GUAM
YAP
ULITHI
PALAU IS
WOLEAI
TRUK
PONAPE
ENEWETAK
KWAJALEIN
KOSRAE
ABEH
TCFA
05/00Z
17/12Z
DTG SPEED INTENSITY
7
09002 145
3
09062 135
7
09122 125
3
09182 120
4
10002 115
2
10062 120
4
10122 115
3
10182 110
7
11002 110
DTG SPEED INTENSITY
6
13062 110
5
13122 110
8
13182 105
6
14002 105
6
14062 100
4
14122 100
6
14182 95
4
15002 90
7
15062 85
6
15122 85
6
15182 80
10

SUPER TYPHOON ABBY (05W)

The tropical disturbance which eventually developed into the second super typhoon of the season was first detected on satellite imagery on 31 July as an area of enhanced convective activity to the southeast of Guam. This disturbance was located near 6N 152E in close proximity to an upper-level anticyclone. Surface data indicated that a weak surface circulation was centered approximately three degrees to the north of the area of convection. Over the next nine days, this circulation developed into an intense super typhoon with maximum sustained winds of 145 kt (75 m/s) and a massive circulation which was the dominant synoptic feature in the western Pacific. Abby's huge circulation system provided the environment for the development of a second tropical system (Tropical Storm Ben), and eventually caused the dissipation of Ben and another tropical storm (Carmen).

The first four days of Abby's development were unimpressive. The disturbance was monitored closely during this period as it moved slowly westward south of Guam. Although diurnal variations in the convective pattern associated with the disturbance made it appear at times that the system was becoming better organized, no consistent increase in organization was apparent until 3 August. At 2300Z on 3 August, a TCFA was issued for an area to the south-southwest of Guam based on the consistent increase in organization of the system observed on satellite imagery. A weather reconnaissance aircraft was launched soon after the TCFA was issued, but it was unable to close off a surface circulation even though several hours were spent investigating the suspect area. The mission did succeed in locating a circulation at flight level (1500 ft - 457 m), and at the 700 mb level.

The second aircraft reconnaissance mission was able to close off a surface circulation the following morning at 050034Z. Maximum sustained winds observed were 30 kt (15 m/s) and the MSLP was 1004 mb. On the basis of this report, the first warning was issued on the system as a tropical depression. The forecast called for continued movement towards the west-northwest with slow intensification.

Initial expectations proved reliable for the first 24 hours in warning status. The system was upgraded to a tropical storm at 050600Z on the basis of an increase in convective organization apparent from satellite imagery. At 060000Z Abby's intensity and position were close to forecast expectations.

Figure 3-05-1. Super Typhoon Abby near maximum intensity (090946Z August DMSP infrared imagery).

Abby started to move on a more northwestward track after 060000Z, even though all JTWC forecast aids were indicating west-northwestward movement. This was a problem that persisted for the next 11 days. Abby continually tracked to the right of JTWC forecasts even though the forecast aids and numerical progs were all consistently in good agreement on a west-northwestward track for Abby.

Intensity forecasting also proved to be difficult. Initial expectations were quite accurate for the first 48 hours in warning status. As expected, Abby was upgraded to typhoon at 061800Z when satellite imagery indicated the presence of a weakness in the central dense overcast. The presence of an eye and the accuracy of the intensity estimate by satellite were confirmed five hours later by reconnaissance aircraft reports of 65 kt (33 m/s) winds and MSLP of 973 mb.

On the 7th of August, Abby began to intensify rapidly, far exceeding initial forecast expectations. Reconnaissance aircraft at 071141Z reported a MSLP of 946 mb, a decrease of 27 mb in approximately 12 hours. Other data (MSLP and equivalent potential temperature relationships (Dunnavan, 1981)) collected on the aircraft reconnaissance mission indicated that Abby was about to undergo rapid intensification. The 071200Z warning called for continued rapid intensification on the basis of this information. This forecast proved to be accurate as Abby continued to intensify rapidly over the next 30 hours reaching 120 kt (62 m/s) intensity within 12 hours and maximum intensity of 145 kt (75 m/s) at 081800Z. Abby's lowest central pressure was recorded at 082049Z when dropsonde data from reconnaissance aircraft indicated a measurement of 888 mb. Figure 3-05-1 shows Abby near maximum intensity. Except for minor fluctuations, Abby's intensity decreased slowly and steadily from this point on.

This decrease in intensity was accompanied by a decrease in forward speed as Abby began a slow northward movement for the next two and one-half days. JTWC forecasts for this two and one-half day period called for slow movement to the north followed by a turn to the northwest toward the island of Okinawa. This forecast track was supported by the FLENUMOCEANCEN numerical prog series which indicated that the subtropical ridge over southern Japan would strengthen and induce a northwestward movement. An example

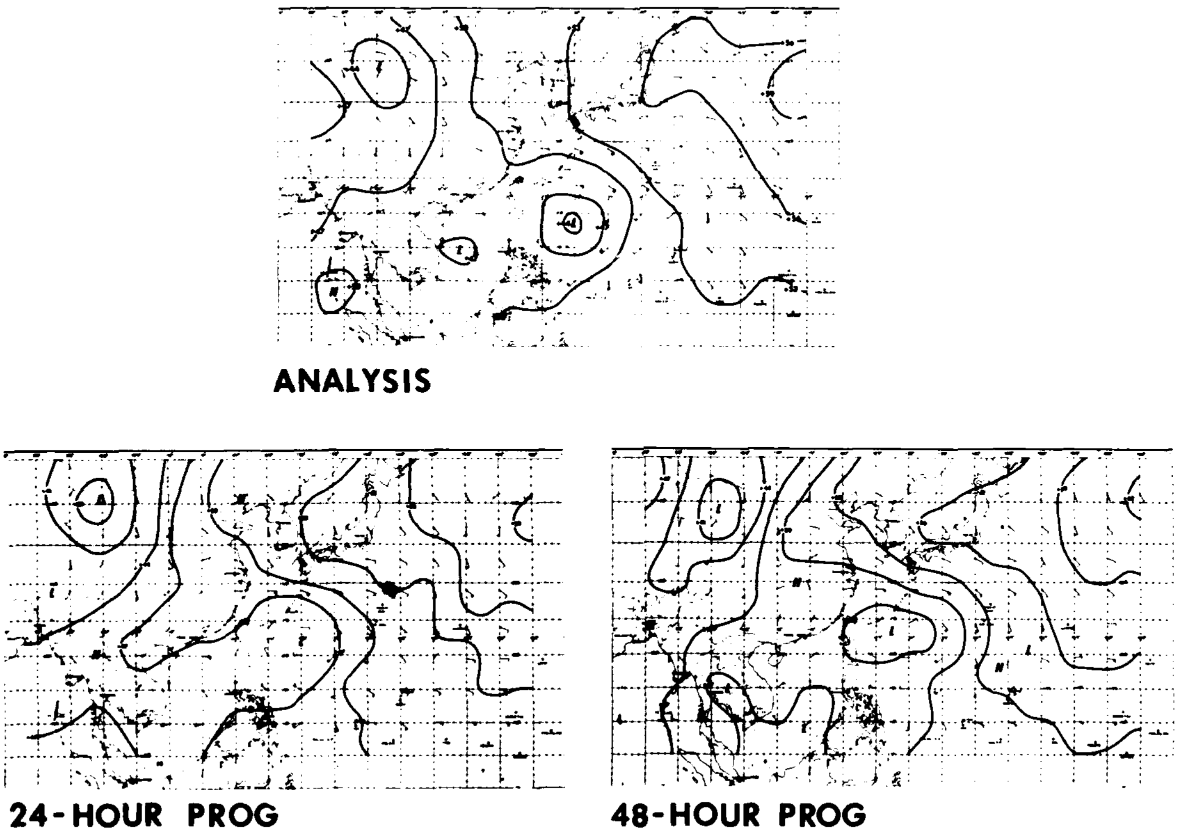


Figure 3-05-2. FLENUMOCEANCEN prog series for 850 mb at 091200Z August. Note that the subtropical ridge over Japan is forecast to remain as a block to northeastward movement.

of the prog series can be seen in Figure 3-05-2 which depicts the 850 mb prog series for 091200Z.

The intensification of the subtropical ridge over Japan that was consistently forecast in the prog series never occurred. An extensive post-analysis of the height fields over Japan and the islands to the south of Japan indicated that the subtropical ridge weakened continuously in this area over the eight day period following the analysis in Figure 3-05-2.

On the 12th of August, Abby began moving northeastward toward Honshu. Also on the 12th, two other tropical systems developed in the western Pacific; Tropical Storm Carmen (06W) in the South China Sea west of Luzon, and Tropical Storm Ben (07W) to the east of Abby near 26N 146E. The interaction of Abby's outflow with a TUTT cell to the northeast created an area of intense upper-level divergence under which Ben formed. The presence of both of these smaller systems had little effect on Abby, except for drawing some of the inflow away; but in the end, it was Abby which led to the demise of both Ben and Carmen when they became embedded in Abby's massive circulation.

As Abby continued its movement towards the northeast, the forecast emphasis changed from a northwest movement to that of a north-northwest movement towards the island of Kyushu. This forecast track was based on the strengthening of the subtropical ridge to the north and east of Abby; but as stated earlier, the ridge did not strengthen and Abby continued to move toward the northeast and weaken slowly. Aircraft reconnaissance data at 141035Z indicated that Abby's central pressure had risen to 942 mb and that the eyewall was beginning to deteriorate. Abby's intensity fell below 100 kt (51 m/s) at 141800Z for the first time in 7 days.

Abby continued moving to the northeast on the 15th of August with a slight increase in forward speed. Application of an objective technique for predicting acceleration (Weir, 1982) led to a forecast of rapid acceleration to the north through central Japan and extratropical transition over the Sea of Japan. This was based on the expectation that Abby would come under the influence of strong southerly flow in advance of a major trough over northern China. The predicted acceleration never materialized as an upper-level ridge developed over the Sea of Japan to the northwest of Abby (Figure 3-05-3) and effectively blocked this interaction.

Japanese weather radar stations started fixing Abby after 160000Z, with all of the fixes showing continued northeast movement. Data from reconnaissance aircraft, satellite imagery, and synoptic reports indicated that Abby was weakening as it underwent extratropical transition. Abby was downgraded to tropical storm at 170000Z and soon after made landfall near Hamamatsu Japan (WMO 47654). After making landfall, Abby moved eastward following the rugged terrain toward Tokyo, weakening rapidly as it interacted with the mountains. At 171200Z, satellite imagery and synoptic data indicated that Abby had completed extratropical transition, and the final warning by JTWC was issued.

Abby's movement through central Japan caused serious damage over a widespread area. Initial reports indicated that at least two people were killed, 29 others were injured, and one person was missing. The torrential rains generated by Abby resulted in widespread flooding, causing numerous landslides and the destruction of 19 bridges. The heavy rains also severely disrupted road, rail, sea and air service in central Japan.

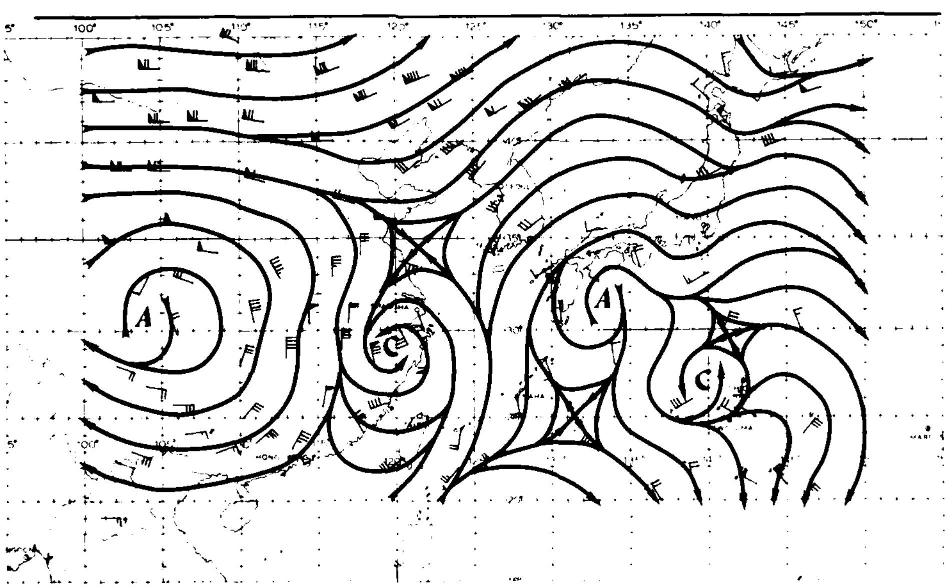
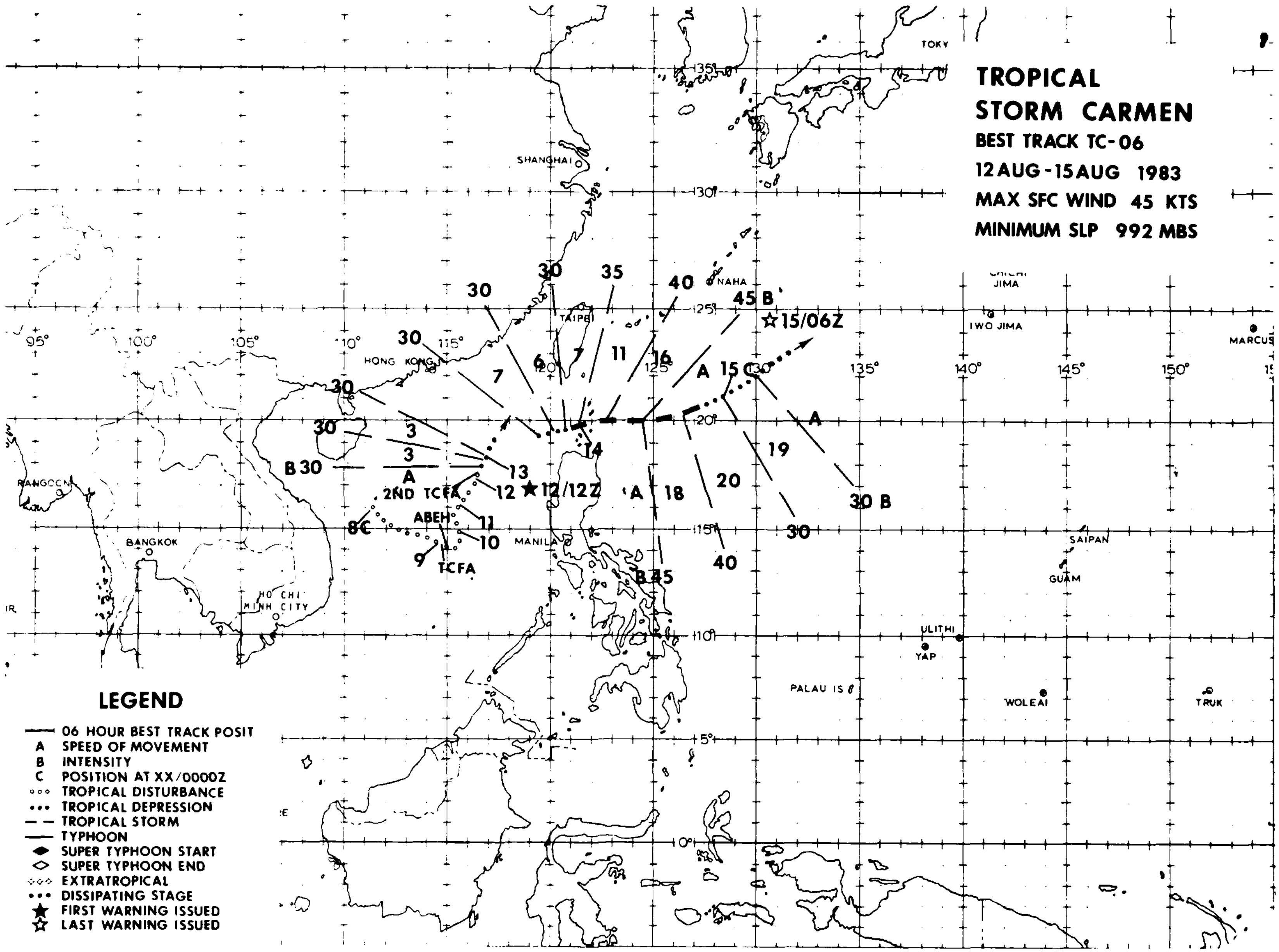


Figure 3-05-3. 200 mb analysis for 170000Z August showing the ridge over the Sea of Japan which prevented Abby from interacting with the westerlies and accelerating northeastward.


TROPICAL
STORM CARMEN
BEST TRACK TC-06
12 AUG-15 AUG 1983
MAX SFC WIND 45 KTS
MINIMUM SLP 992 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SHANGHAI
TAIPEI
NAHA
HONG KONG
MANILA
BANGKOK
HO CHI MINH CITY
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
12/12Z
15/06Z
2ND TCFA
TCFA
ABEH

Tropical Storm Carmen had its origins in the monsoon trough which was well established over Southeast Asia and moved into the South China Sea in early August. A low level circulation first located about 200 nm (370 km) east of Vietnam persisted as a closed circulation on the surface streamline analysis and as an area of enhanced convective activity on satellite imagery for several days while moving slowly eastward along the trough axis. At the same time, Super Typhoon Abby was undergoing rapid intensification in the Philippine Sea. Abby's outflow generated a strong easterly flow at upper-levels which was expected to inhibit the development of the tropical disturbance in the South China Sea. However, on 9 August, satellite imagery at 0000Z indicated that outflow was developing over the South China Sea disturbance. Synoptic data also indicated that the low-level circulation had become better organized and had associated surface winds of 20 kt (10 m/s) and an MSLP of 1002 mb. This increase in organization prompted the issuance of a TCFA at 090300Z.

The disturbance remained in alert status for the next three days as it tracked slowly north-northeastward with little change in intensity. Aircraft reconnaissance at 120247Z indicated that the disturbance was still poorly organized with an MSLP of 1000 mb. Satellite imagery during this period also indicated little increase in convective organization. At 120900Z, satellite imagery indicated that the disturbance had developed a small central convective feature. The initial warning for Carmen as a tropical depression was issued at 121200Z on the basis of this increase in convective organization.

For the rest of the day, Carmen tracked slowly north-northeastward without any further development in convective organization. Suddenly, between 130000Z and 130600Z, the depression appeared to rapidly accelerate from 3 to 26 kt (2-13 m/s) and move east-northeastward toward the Luzon Straits. Warnings at the time reflected this rapid acceleration. However, in post-analysis, satellite imagery indicated the presence of several weak circulations (eddies) near the Luzon Straits during this period. A new circulation established itself 70 nm (130 km) to the northwest of Luzon, approximately 170 nm (315 km) east of Carmen. It was this new circulation that was tracked from 130600Z onward as Carmen. The disturbance that was initially designated Carmen, continued its north-northeastward track and persisted as a small area of convection for another 18 hours before eventually dissipating over water on 14 August. The new disturbance that was now designated Carmen, moved east-northeastward through the Luzon Straits, embedded in the low-level flow feeding into Super Typhoon Abby in the Philippine Sea. In spite of the hostile shearing environment and the fact that the depression was embedded in Abby's inflow, intensification of this circulation continued and upgrade to tropical storm occurred on the 131800Z warning.

Carmen continued to intensify, reaching maximum intensity of 45 kt (23 m/s) at 141200Z while accelerating toward Abby. Figure 3-06-1 shows Carmen near maximum intensity 100 nm (185 km) northeast of Luzon. Less than 12 hours later, at 142300Z, Carmen was almost completely absorbed into Abby's circulation and was no longer "fixable" by reconnaissance aircraft.

The final warning on Carmen, now a tropical depression, was issued on the 15th at 0600Z when it became impossible to identify the remnants of the system on satellite imagery.

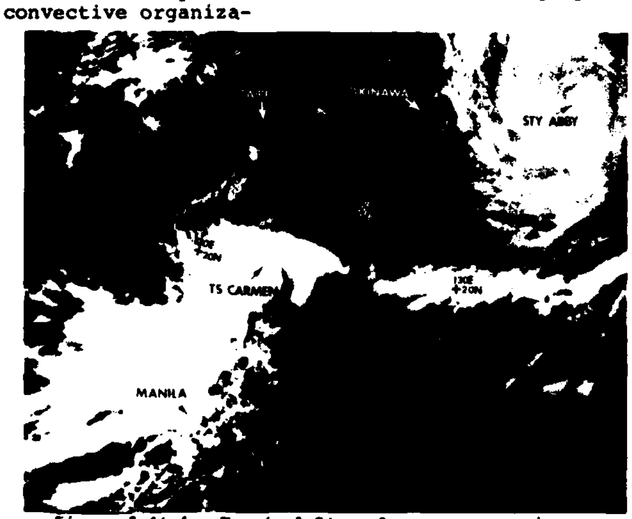
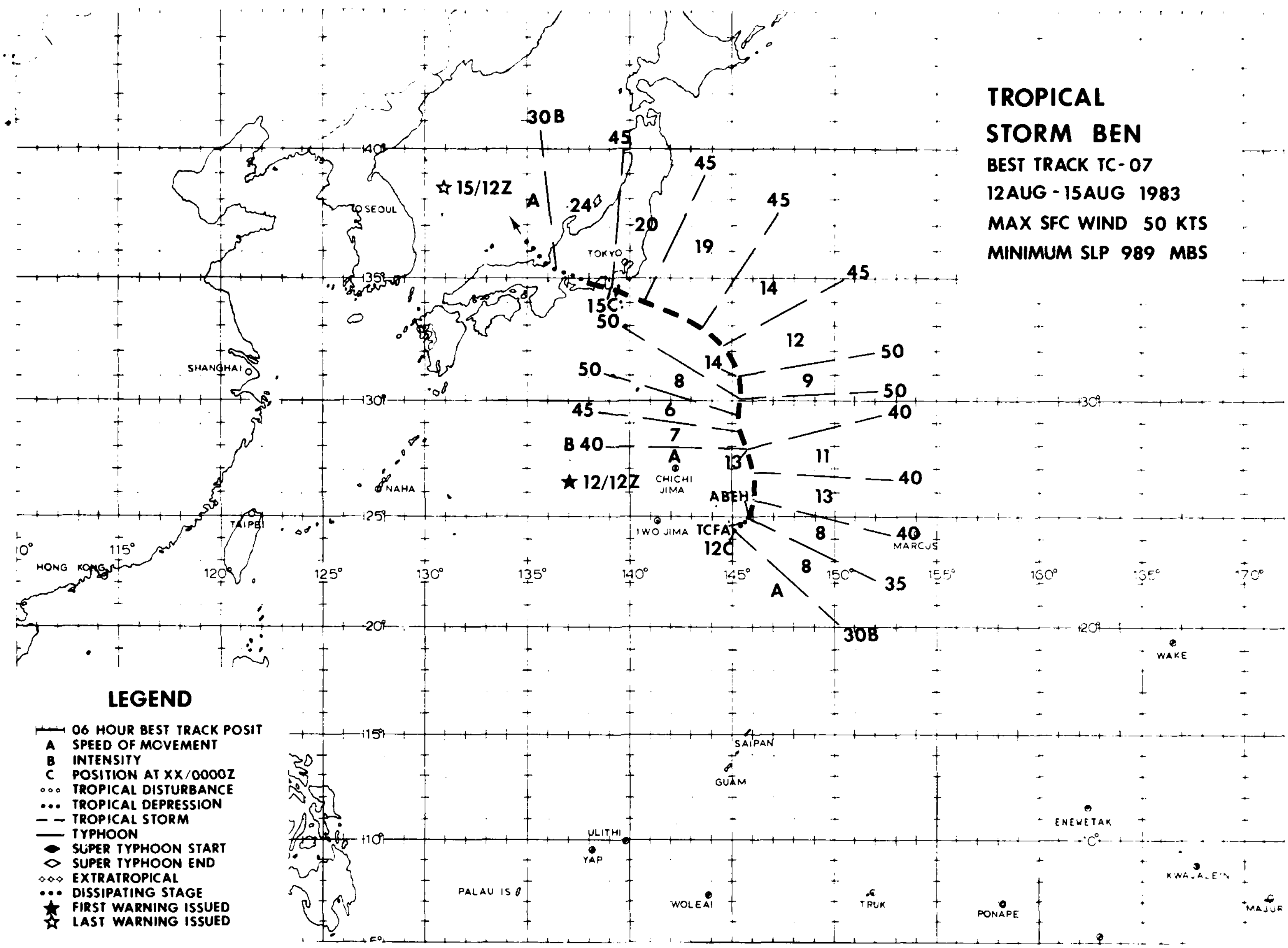


Figure 3-06-1. Tropical Storm Carmen near maximum intensity 100 nm (185 km) northeast of Luzon. Super Typhoon Abby (upper right) completely absorbed Carmen into its circulation less than a day later (140632Z NOAA 7 visual imagery).



TROPICAL
STORM BEN
BEST TRACK TC-07
12AUG - 15AUG 1983
MAX SFC WIND 50 KTS
MINIMUM SLP 989 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
15/12Z
12/12Z
TCFA
ABEH
SEOUL
TOKYO
SHANGHAI
TAIPEI
HONG KONG
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENEWETAK
KWAJALEIN
MAJURO

As Typhoon Abby approached Japan from the southwest, satellite imagery indicated that an area of intense convection was forming on the eastern periphery of its circulation (Figure 3-07-1). Surface and 200 mb analyses at the time (Figure 3-07-2 and 3-07-3) indicated that the convection was not associated with a separate surface circulation but with an area of highly divergent flow at upper-levels. This flow was associated with a TUTT cell located to the northeast of Abby.

This area of active convection persisted with no apparent associated low-level circulation until 12 August, when visual satellite imagery indicated the presence of a low-level circulation on the western edge of the convective activity. The presence of a surface circulation in an area of such strong upper-level divergence prompted the issuance of a TCFA at 120419Z.

Reconnaissance aircraft investigated this area later in the day and located a poorly defined circulation with a highly asymmetric wind field. Winds of 40 kt (21 m/s) were observed over a broad area in the southeastern semicircle of the circulation but winds to the north and west were in the 10-20 kt (5-10 m/s) range. The first warning for Tropical Storm Ben was issued at 121200Z and forecasted northwestward movement up the eastern coast of Japan at the periphery of the subtropical ridge. This forecast scenario appeared valid for the next 24 hours as Ben moved northward and turned westward as expected. However, westward motion was greater than originally forecast and Ben moved rapidly along the southern coast of Honshu prior to making landfall west of Hamamatsu (WMO 47654). As Ben moved westward, it entered an area of strong upper-level flow associated with outflow from Typhoon Abby. Satellite imagery indicated that the convection associated with Ben was dissipating and appearing at successively greater separation distances to the east of the low-level circulation center.

By 14 August, Ben was a completely exposed low-level circulation and remained so until dissipation in the Sea of Japan at 151200Z.

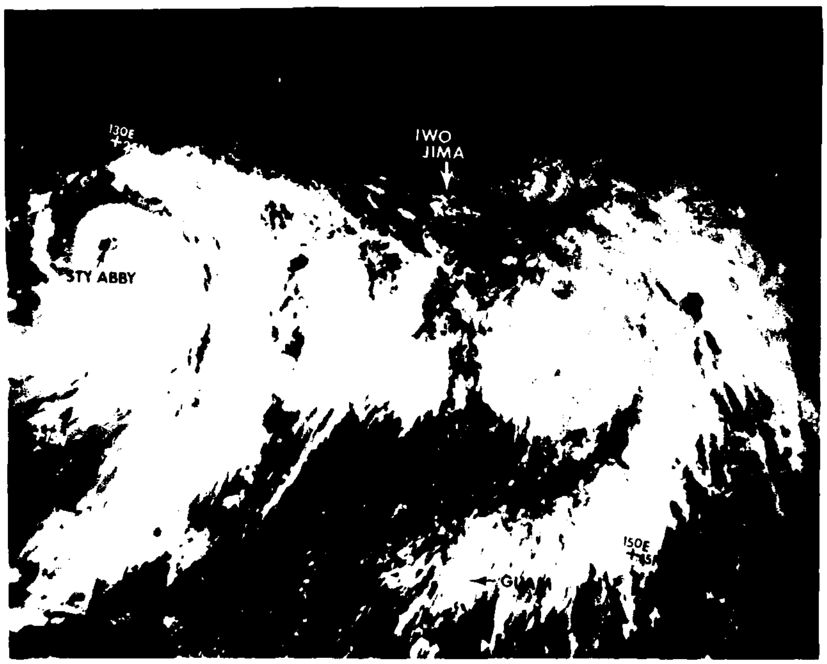


Figure 3-07-1. Typhoon Abby (left) and the area of enhanced convective activity to the east where Tropical Storm Ben formed. (110527Z NOAA 7 visual imagery).

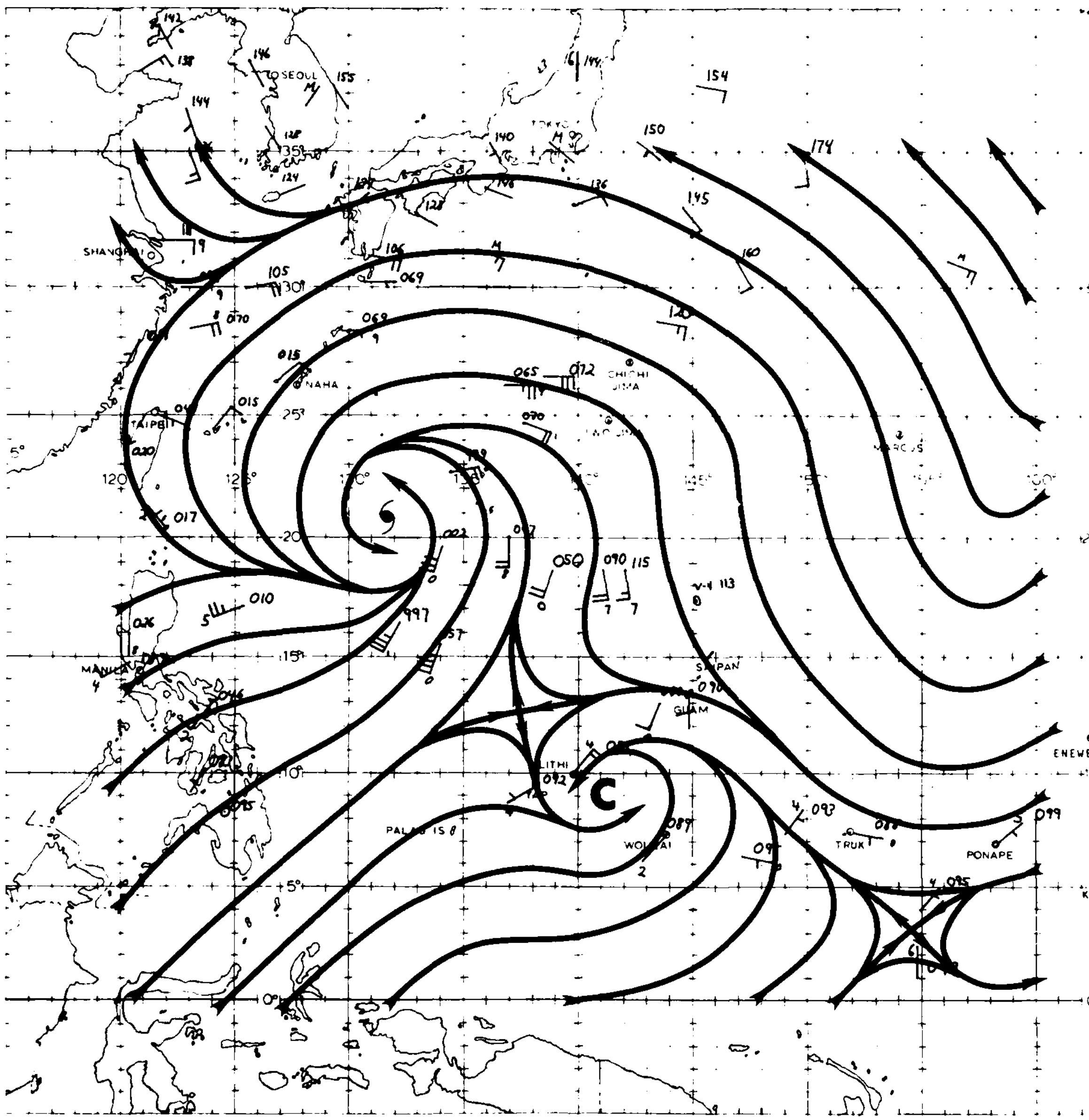


Figure 3-07-2. 110000Z surface analysis. Although analysis time corresponds closely with the time of the satellite picture shown in Figure 3-07-1, there is no indication of a surface circulation in the area where Ben formed 24 hours later.

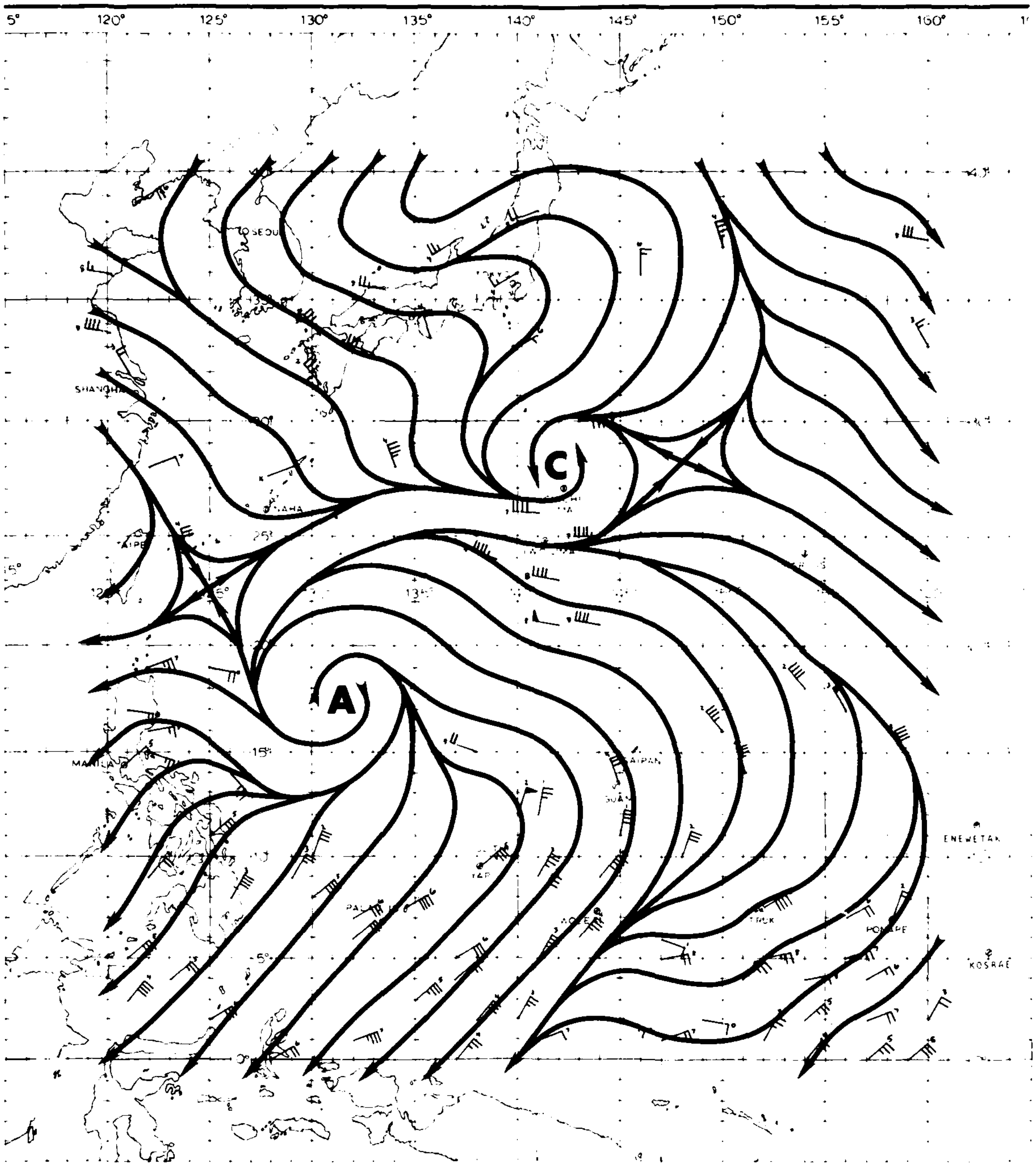


Figure 3-07-3. 110000Z 200 mb analysis. The area of enhanced convective activity to the east of Abby in Figure 3-07-1 corresponds to an area of highly divergent upper-level flow created by the interaction of Abby's outflow with a TUTT cell.

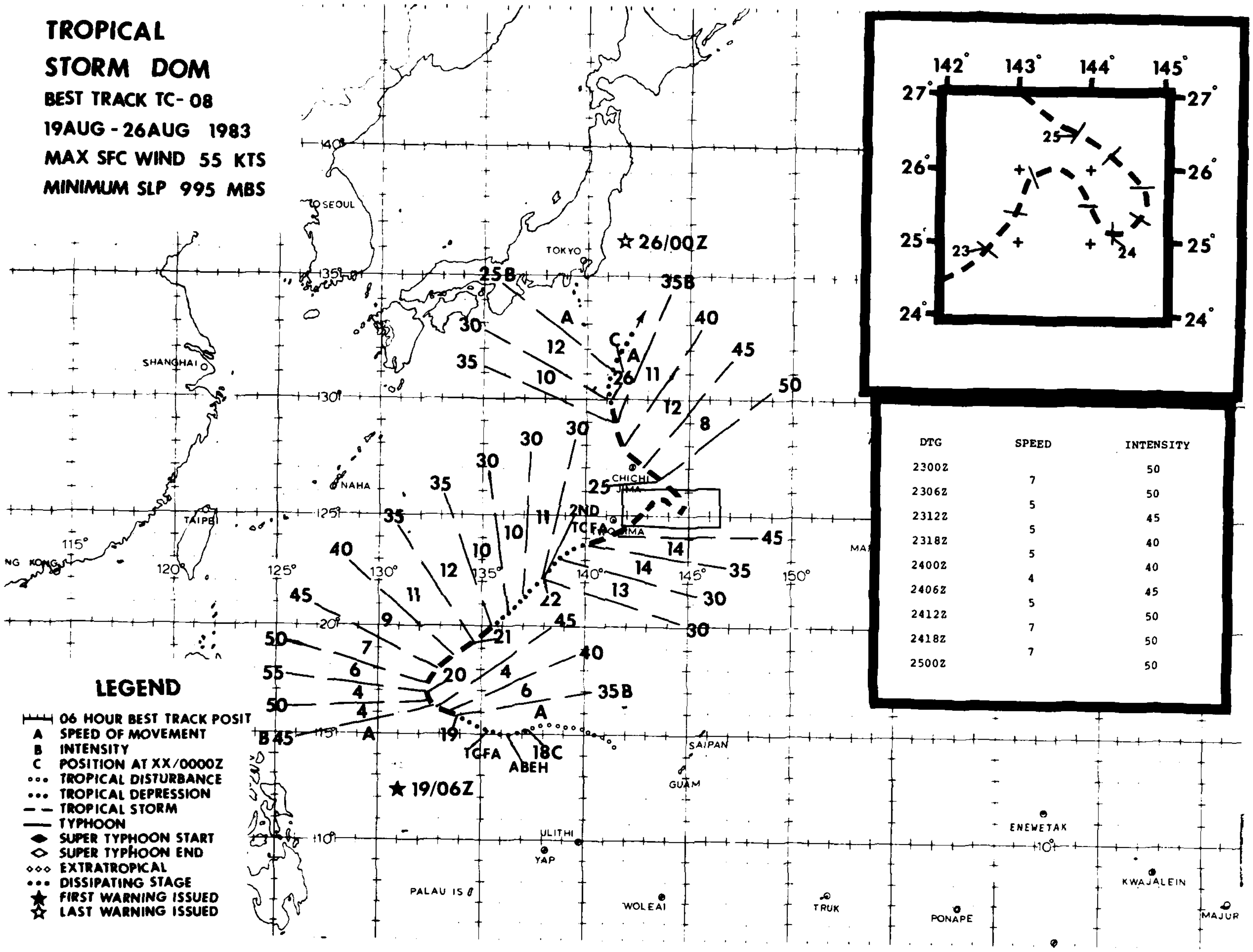
TROPICAL STORM DOM

BEST TRACK TC-08

19AUG - 26AUG 1983

MAX SFC WIND 55 KTS

MINIMUM SLP 995 MBS



DTG	SPEED	INTENSITY
2300Z		50
2306Z	7	50
2312Z	5	45
2318Z	5	40
2400Z	5	40
2406Z	4	45
2412Z	5	50
2418Z	7	50
2500Z	7	50

LEGEND

- 06 HOUR BEST TRACK POSIT
- A SPEED OF MOVEMENT
- B INTENSITY
- C POSITION AT XX/0000Z
- ∘∘∘ TROPICAL DISTURBANCE
- ••• TROPICAL DEPRESSION
- — — TROPICAL STORM
- —— TYPHOON
- ◆ SUPER TYPHOON START
- ◇ SUPER TYPHOON END
- ◇◇◇ EXTRATROPICAL
- ••• DISSIPATING STAGE
- ★ FIRST WARNING ISSUED
- ☆ LAST WARNING ISSUED

TROPICAL STORM DOM (08W)

Tropical Storm Dom developed from a disturbance which was initially detected west of Guam on 17 August. Over the 10 day period of its life, Dom underwent radical changes in track and intensity. These changes and Dom's lack of significant vertical development created difficulties for JTWC forecasters. Radical intensity changes resulted in a 36-hour period when no numbered tropical cyclone warnings were issued on Dom by JTWC (21-23 August).

As Super Typhoon Abby approached Tokyo on 17 August, low latitude wind regimes began to return to their seasonal mean locations. Figure 3-08-1 shows the orientation of the low-level monsoon and upper-tropospheric troughs on 17 August, as well as the climatological positions for each for the month of August. Of significance is the position of the low-level trough to the west of the upper-level trough, which was anchored to an intense upper-tropospheric cyclone near Guam. As this occurred, an area of strong upper-level divergence formed in the northeasterlies to the west of the upper-level cyclone and a convective disturbance developed within the low-level trough.

On 18 August, a reconnaissance aircraft investigated the disturbance at 700 mb and reported flight level winds of 25 kt (13 m/s) and an extrapolated MSLP of 999 mb. On the basis of this report and subsequent satellite imagery which indicated increased convective organization, a TCFA was issued at 181100Z. The next reconnaissance aircraft mission, at 190735Z, located a well defined surface circulation with an MSLP of 1004 mb and maximum sustained surface winds of 40 kt (21 m/s). The initial warning for Tropical Storm Dom was issued on receipt of this information from the aircraft.

During the two-day period prior to initial warning, Dom had tracked steadily westward at 9 kt (5 km/hr). In spite of this, continued westward movement was rejected by JTWC forecasters and Dom was forecast to move northward from the initial warning. Figure 3-08-2 shows the guidance available to JTWC forecasters from the objective forecasting techniques for the 191200Z warning (Note: objective techniques are originated from a preliminary best track position six hours prior to warning time - in this case 190600Z). Although there were considerable differences in the forecast aids, both dynamic models (NTCM and OTCM) predicted northward movement, reflecting the absence of a strong subtropical ridge. The Prognostic Reasoning Message (WDPA1 PGTW) which was issued following the 191200Z warning is the best summary of the situation.

"Dom is forecast to turn northward during the next 24 hours. Low-level steering is predominately from south-to-north and the presence of middle-tropospheric westerlies north of 22N is seen as evidence of the overall weakness of the subtropical ridge over the Philippine Sea." "The most significant feature on the charts is a deep, complex low pressure area which extends eastward from Japan. The FLENUMOCEANCEN prognosis series maintains this mid-latitude trough throughout the forecast period. Its influence is expected to maintain the weakness in the ridge and allow Dom to move northward. Not forecast by the numerical prognoses, but considered possible, is an increase in the southwest monsoonal flow over the Philippine Sea. A linkage between the southwest monsoon and the mid-latitude trough, east of Japan, could cause Dom to track northeastward instead."

The alternate scenario proved correct, as Dom turned sharply northeastward on 20 August.

Throughout much of its life, Dom's low-level center was located northeast of its significant convection. Strong upper-level northeasterlies were exerting considerable pressure on the atmospheric column above Dom, resulting in the consistent tilt toward the southwest. The mission ARWO[1] on the 192330Z fix mission observed "The extremely slight pressure gradient indicated that this was probably a shallow tropical cyclone....the 700 mb center was located southwest, relative to the surface center, but even further displaced (from the earlier penetration). A solid "wall" of convective activity seemed to be developing at this time, extending through the southwest quadrants." This observation was made at Dom's peak intensity of 55 kt (28 m/s).

As Dom turned northeastward, the area of strongest convective activity became further separated from the surface center (Figure 3-08-3) and eventually weakened. On 21 August, reconnaissance aircraft verified the weakening of the system as observed on satellite imagery. Surface winds near the center were light and surface pressures were up significantly although stronger, near gale-force, winds were present 50 to 60 nm (93 to 111 km) southeast of the surface center, within the monsoonal flow. Since Dom was not expected to reintensify in such a hostile shearing environment, tropical cyclone warnings were suspended after the issuance of the 211200Z warning. In the

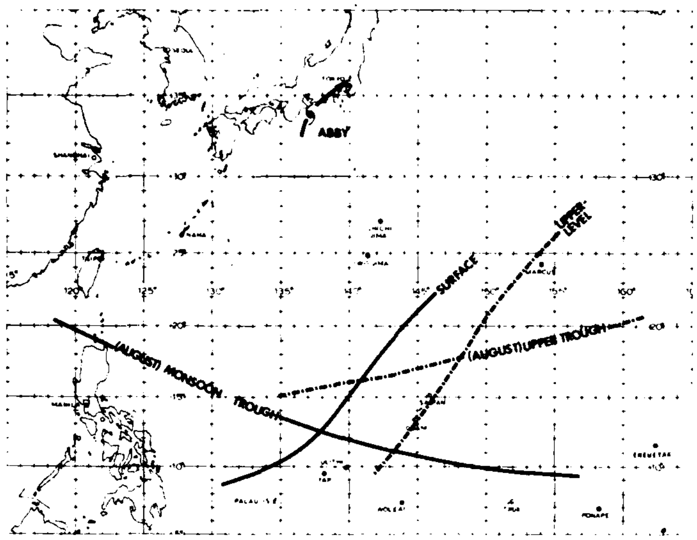


Figure 3-08-1. Location of the axis of the low-level and upper-level troughs on 17 August and the monthly climatological position of the monsoon (low-level) and tropical upper-tropospheric troughs for August. Note the northeast to southwest orientation of each trough on the 17th, and the atypical location of the low-level trough west of the upper-level trough.

subsequent 12 hours, satellite imagery indicated that convective activity was increasing near the center, prompting the issuance of a TCFA at 212330Z. An aircraft reconnaissance mission was flown at 220612Z and found 30 kt (15 m/s) surface winds more than 200 nm (370 km) southeast of a 1003 mb surface center. However, the next mission, at 222351Z found a 995 mb center with a 40 kt (21 m/s) maximum wind 10 nm (19 km) east of the surface center. On the basis of this report, Tropical Storm Dom was returned to warning status at 230000Z while the aircraft was still in the center. As the aircraft exited to the south, it encountered even stronger winds than those previously reported. The following was extracted from the ARWO's[2] post flight mission report:

> "This system continued to have a majority of its weather concentrated in the south....showers were very heavy and ominous looking, in fact, I observed a waterspout trailing from one of the heavier showers. Even though we were only 60 to 100 nm (111 to 185 km) from the center during the invest, we found light and variable winds, especially in the northern half of the storm. I was hard pressed to close off the circulation in the northwest quadrant. Once closed off, the storm showed itself to be a highly compact area of 40 kt (21 m/s) surface winds, extending 45 nm (83 km) from the center. The center itself was a small area, 3 to 5 nm (6 to 9 km), where the pressure dropped rapidly. This area of low pressure was very definite, but difficult to hit exactly due to its highly localized area. After the fix, we headed due south and, in a 30 nm (56 km) wide band beginning 20 nm (37 km) from the surface center, I observed surface winds reaching 50 kt (26 m/s) with gusts to 60 kt (31 m/s)."

Figure 3-08-4 shows Dom just prior to this aircraft mission.

During Dom's northeastward trek, its movement was correlated to the monsoon southwesterlies and a stationary mid-latitude trough located east of Japan. On 22 August, this trough, including the extratropical remains of Super Typhoon Abby (05W) began to move eastward and weaken. This change, along with a lessening of the influence of the upper-tropospheric northeasterlies over Dom, were contributing factors in Dom's reintensification. It also marked a change in steering influences which resulted in Dom moving erratically from 231200Z to 241200Z, prior to assuming a north-northwestward track. During this period, Dom's intensity dropped slightly, to 40 kt (21 m/s) but peaked again briefly as an upper-level anticyclone became established over the system (Figure 3-08-5). However, this upper-level support proved to be short-lived and Dom was reduced to an exposed low-level circulation of tropical depression intensity a day later.

[1]Mission ARWO (Aerial Reconnaissance Weather Officer), 1Lt Gregory T. Marx, USAF.

[2]Mission ARWO, Capt Stephen W. Lizon, USAF.

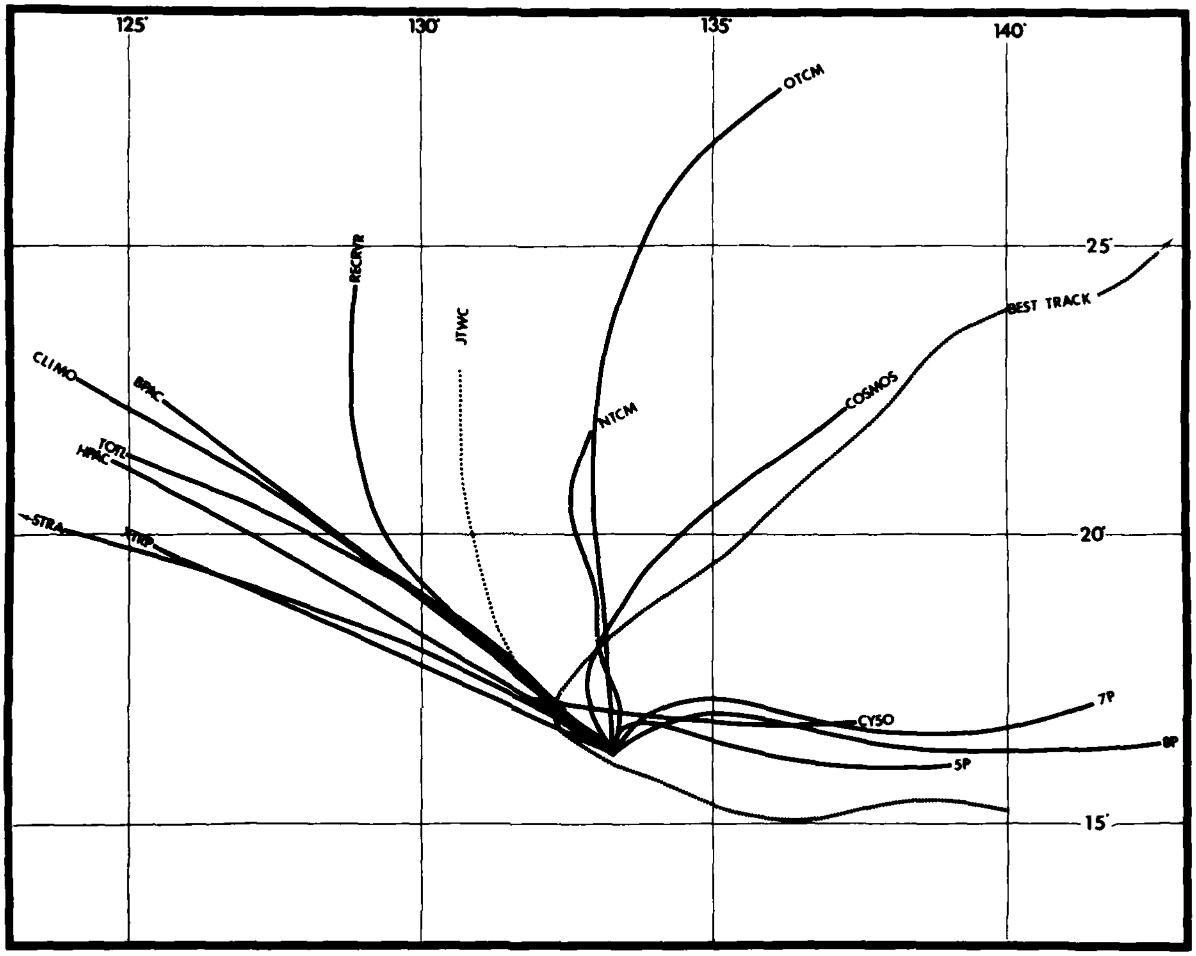


Figure 3-08-2. The standard array of JTWC's objective forecasting techniques available to support the 191200Z warning. Included is the forecast issued at 191200Z and the eventual best track. Note that the technique "COSMOS", currently under test and evaluation at JTWC, did a superior job in forecasting the eventual track.

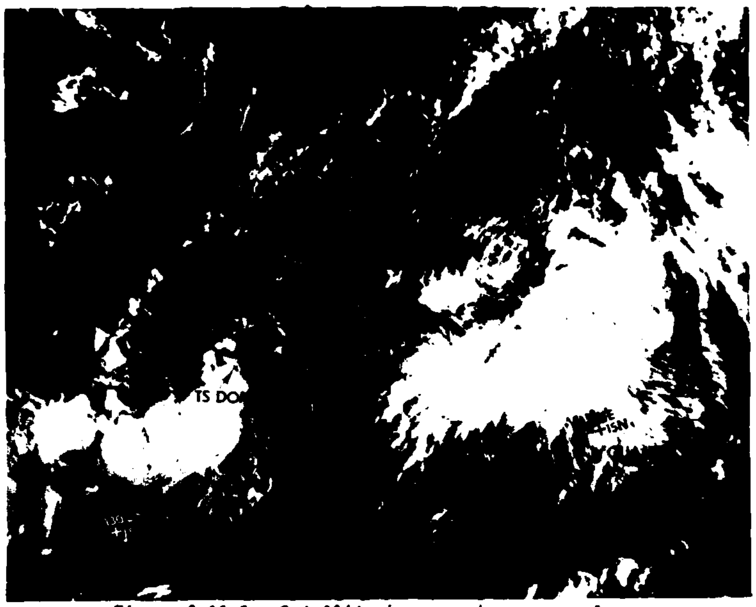


Figure 3-08-3. Satellite imagery shows several convective cells extending toward the southwest and west of Dom's low-level center (202234Z August NOAA 8 visual imagery).

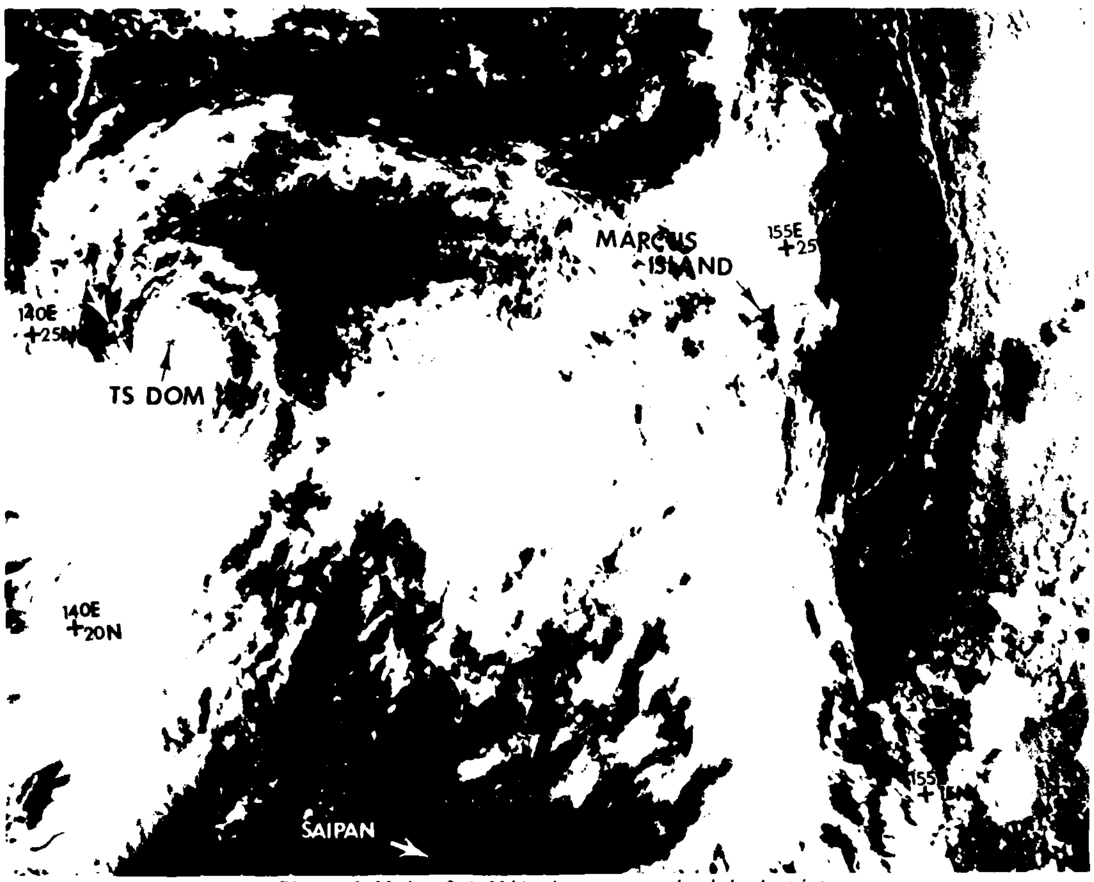
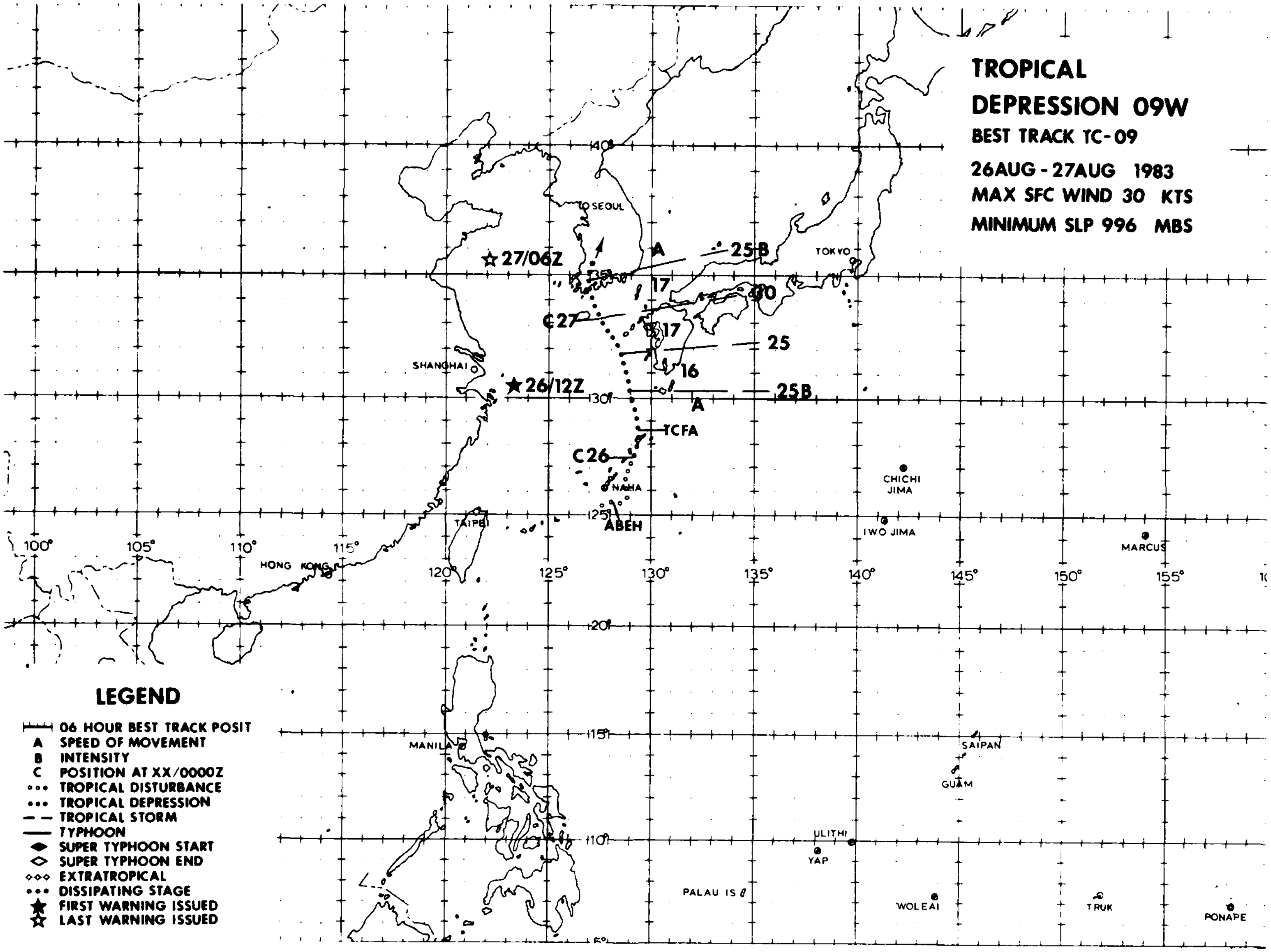


Figure 3-08-4. Satellite imagery received just prior to aircraft data indicates that the system had reintensified. Note the low-level cloud lines which correspond to the ARWO's description of the system (222150Z August NOAA 8 visual imagery).

Figure 3-08-5. In a last, but brief, period of reintensification, satellite imagery indicates an upper-level anticyclone forming over Dom's low-level center (242033Z August DMSP visual imagery).


TROPICAL
DEPRESSION 09W
BEST TRACK TC-09
26AUG-27AUG 1983
MAX SFC WIND 30 KTS
MINIMUM SLP 996 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
27/06Z
26/12Z
C27
C26
TCFA
ABEH
SEOUL
TOKYO
SHANGHAI
TAIPEI
NAHA
HONG KONG
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
100°
105°
110°
115°
120°
125°
130°
135°
140°
145°
150°
155°

TROPICAL DEPRESSION (09W)

Tropical Depression 09W was unusual in that it developed in an area where tropical cyclogenesis is a rare event. It was first detected as a tropical disturbance located 60 nm (111 km) south of Okinawa on the 25th of August. At this time, the monsoon trough was displaced far to the north of its climatological position following the passage of Tropical Storm Dom. Tropical Depression 09W formed to the west of Dom in an area of highly convergent low-level flow.

Tropical Depression 09W was first mentioned in the Significant Tropical Weather Advisory (ABEH PGTW) at 0600Z on the 25th. Upper-level flow in the vicinity of the circulation was highly divergent and Dvorak intensity estimates indicated that maximum sustained winds associated with the circulation were 30 kt (15 m/s). Tropical Depression 09W showed no signs of further development in the next 24 hours of its existence. However, a TCFA was issued at 260400Z because the favorable upper-level conditions indicated a good potential for intensification of the circulation.

Soon after the TCFA was issued, satellite imagery (Figure 3-09-1) revealed an exposed low-level circulation with associated convective activity displaced 300 nm (555 km) to the south. Synoptic data at the time indicated that the central pressure of the depression was below 1000 mb but the area of maximum winds was 100 nm (185 km) from the center. At this point, it was expected that the circulation would become better organized and pose a threat to nearby population centers in Japan and Korea. Accordingly, the first warning on Tropical Depression 09W was issued at 261200Z.

The only aircraft reconnaissance mission flown on this system was conducted at 2330Z on the 26th. Terrain in the area precluded a low-level flight and severely restricted the collection of peripheral data. However, the height of the 700 mb center supported a maximum surface wind speed of 30 kt (15 m/s). This intensity was in perfect agreement with simultaneous estimates using satellite imagery.

Tropical Depression 09W never developed into a tropical storm and dissipated rapidly after making landfall on the southern coast of Korea. Although the East China Sea was dominated by cloudiness and rain showers during its passage, there were no reports of injury or property damage related to this depression.

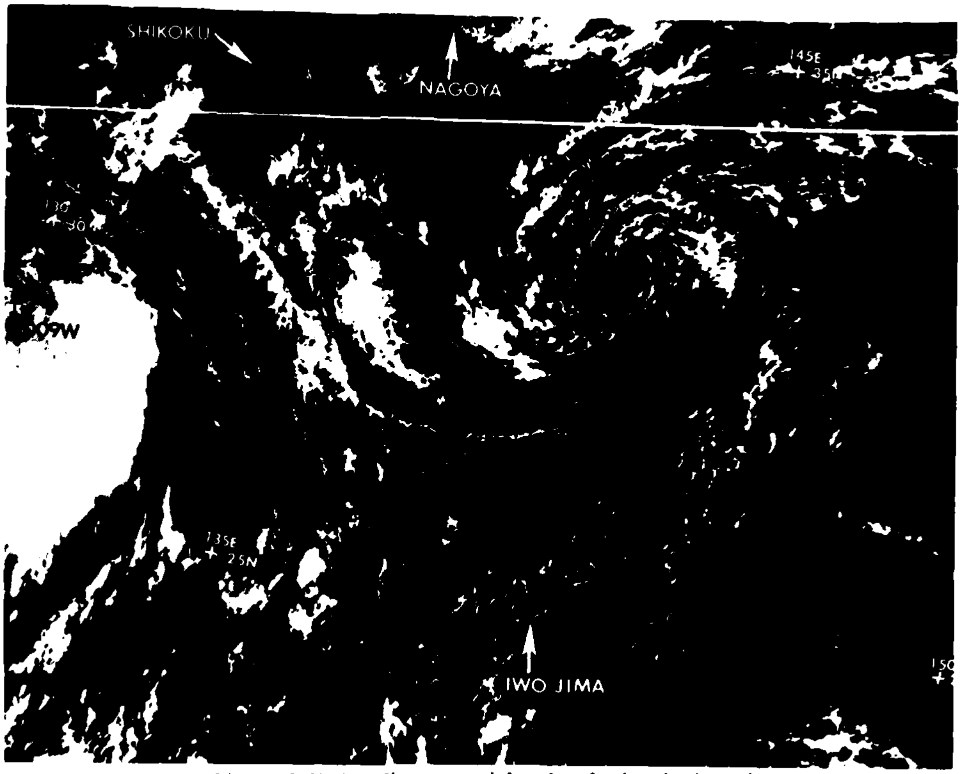
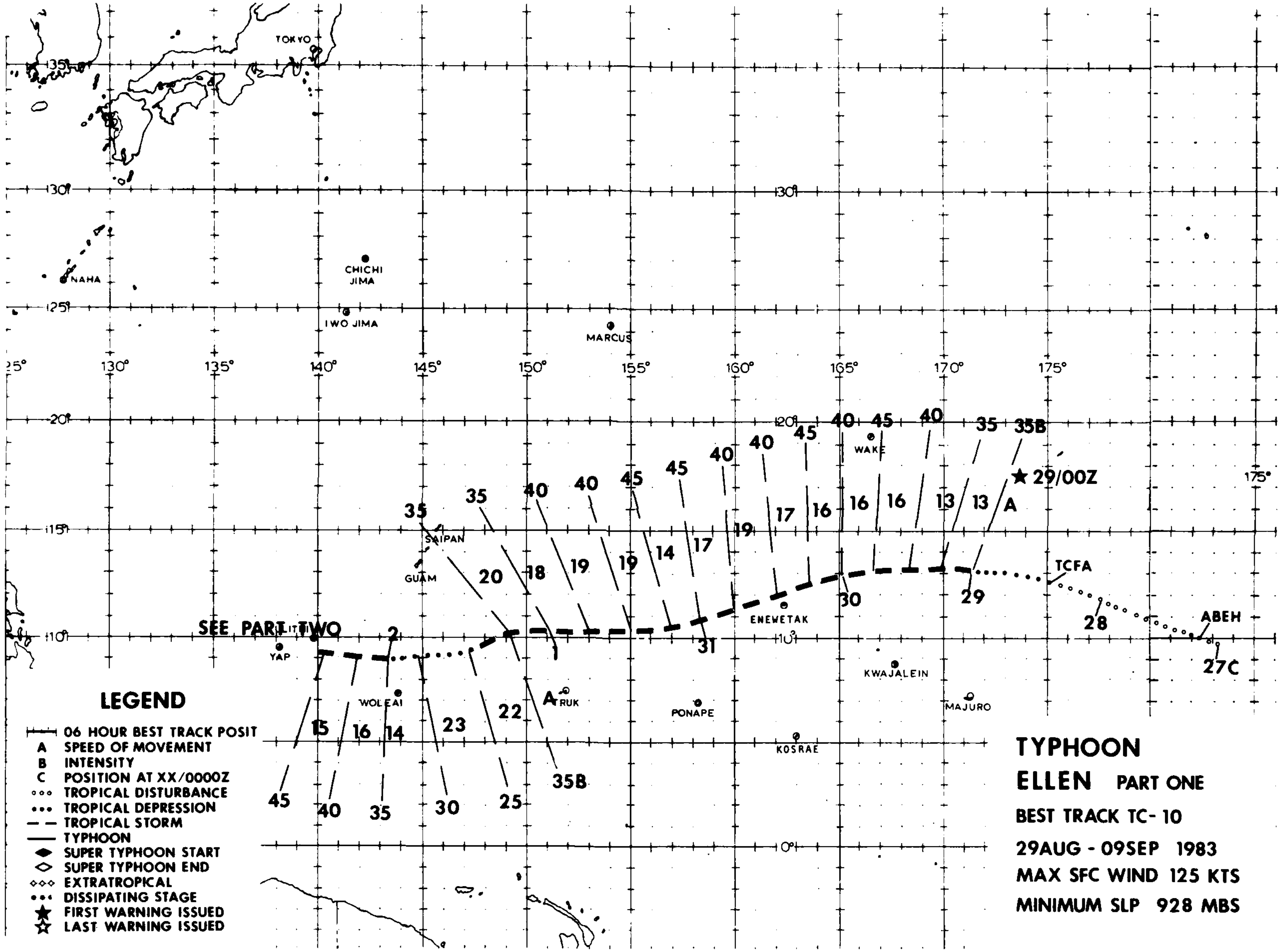
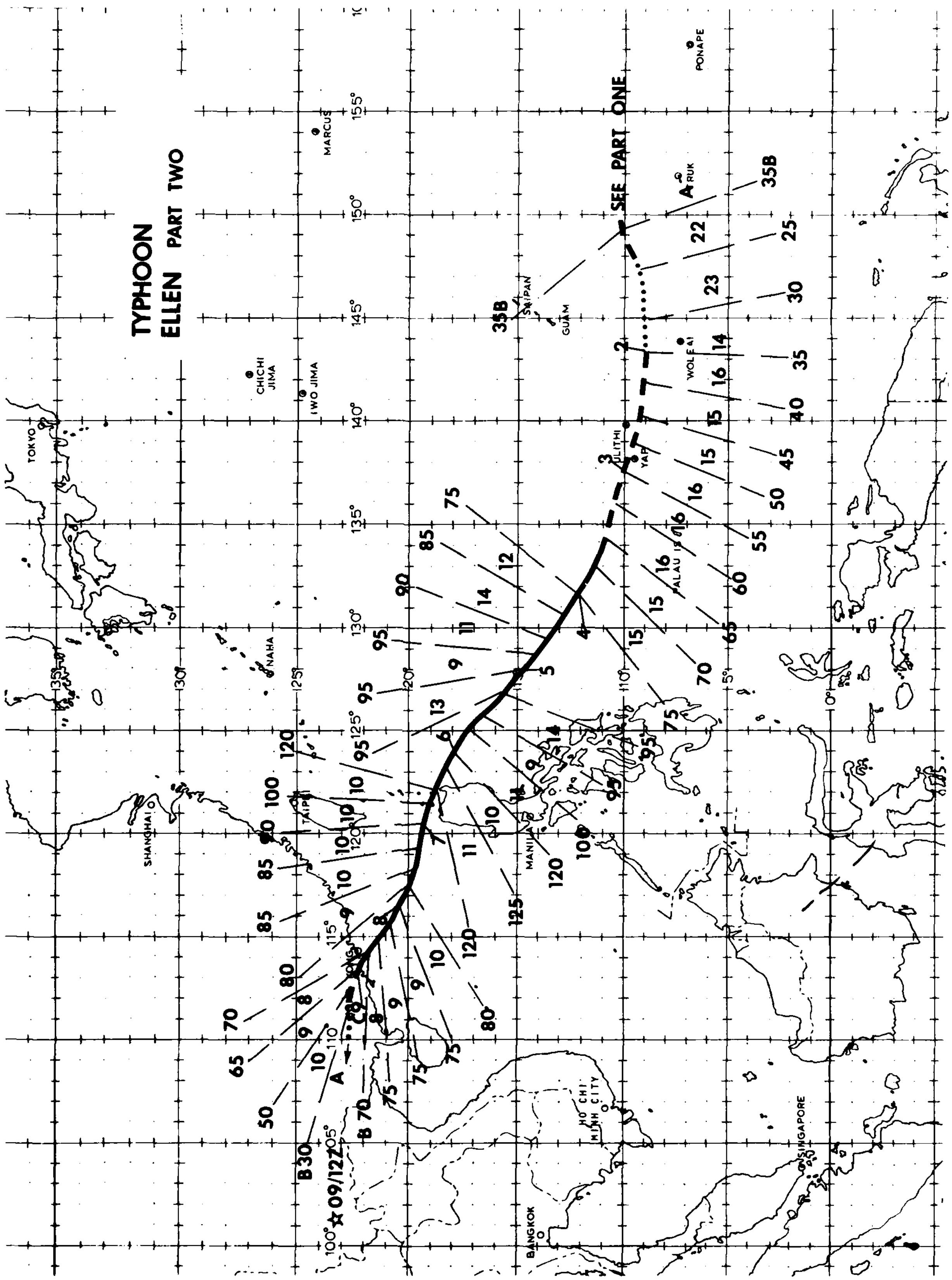


Figure 3-09-1. The exposed low-level circulation of TD 09W (left) and Tropical Storm Dom (right) in its dissipation stage (260546Z August NOAA 7 visual imagery).



TOKYO
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
YAP
WOLEAI
TRUK
PONAPE
ENEWETAK
KWAJALEIN
MAJURO
KOSRAE
SEE PART TWO
TCFA
ABEH
★ 29/00Z
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TYPHOON
ELLEN PART ONE
BEST TRACK TC- 10
29AUG - 09SEP 1983
MAX SFC WIND 125 KTS
MINIMUM SLP 928 MBS


TYPHOON
ELLEN PART TWO
SEE PART ONE
TOKYO
MARCUS
CHICHI JIMA
IWO JIMA
NAHA
SHANGHAI
TAIPEI
MANILA
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
PALAU IS
HO CHI MINH CITY
BANGKOK
SINGAPORE
09/12Z

TYPHOON ELLEN (10W)

Typhoon Ellen first became apparent on satellite imagery as a tropical disturbance located near 10N 170W on the 26th of August. The disturbance was located in a data-sparse area, making it difficult to estimate its degree of organization or intensity. Satellite intensity estimates using the Dvorak method indicated maximum sustained winds of 30 kt (15 m/s). These estimates were based primarily on the presence of upper-level banding features. Because of its impressive appearance on satellite imagery, the disturbance was mentioned in the Significant Tropical Weather Advisory (ABEH PGTW) on the 27th. At this time, the disturbance was not located in the JTWC area of responsibility (AOR) but it was moving westward and it was becoming a matter of increasing concern to interests in the eastern portion of the JTWC AOR.

The disturbance crossed the dateline and entered the JTWC AOR on the 28th. A TCFA was issued at 281100Z as the system, now associated with a weak upper-level anticyclone, continued moving westward. Satellite imagery indicated that the disturbance was intensifying with maximum sustained winds of 35 kt (18 m/s). This prompted the issuance of the first warning on Ellen at 290000Z which projected continued west-northwestward movement and intensification.

During the next five days, Ellen's intensity fluctuated between 25 and 45 kt (13-23 m/s). Further development during this period was inhibited by the lack of low-level westerly inflow and the restriction of upper-level outflow channels to the north by a large upper-level anticyclone centered south of Japan. This large upper-level anticyclone was a manifestation of an intense cell of high pressure which extended throughout the troposphere and had a tremendous impact on Ellen. In addition to interferring with Ellen's outflow at upper-levels, it prevented continued west-northwestward movement and caused Ellen to assume a southwestward track around its southern periphery at speeds of 13 to 23 kt (7-12 m/s). This high speed of movement, combined with outflow restrictions, caused Ellen to weaken to tropical depression intensity briefly on the 1st of September.

After reaching a minimum intensity of 25 kt (13 m/s) at 011200Z, Ellen began to strengthen, reaching typhoon intensity two days later at 031200Z. Upper-level flow patterns during this period were very favorable for the development of outflow channels. A TUTT cell over the South China Sea (Figure 3-10-1) was instrumental in providing the proper environment for the establishment of outflow to the north. Coincident with Ellen's intensification was a change in track from west-southwestward to west-northwestward. This marked Ellen's transit beyond the southernmost point of the massive high previously discussed.

Figure 3-10-1. Favorable upper-level conditions led to Ellen's reintensification after weakening to a tropical depression on 1 September (021200Z September 200 mb analysis).

By 051200Z, Ellen was located 200 nm (370 km) east of Luzon with maximum sustained winds of 95 kt (49 m/s). An objective technique for forecasting the onset of explosive deepening (Dunnavan, 1981) indicated that Ellen would deepen rapidly over the next 34 hours. The reliability of this technique was verified when Ellen's central pressure dropped 28 mb to 928 mb over the next 12 hours. Ellen reached maximum intensity of 125 kt (64 m/s) shortly thereafter, at 060600Z (Figure 3-10-2).

This peak in intensity was short-lived due to interaction between the southern part of Ellen's circulation and Luzon. Ellen weakened continuously from this point on as it moved through the Luzon Straits and headed for southern China.

Fix information on Ellen was exceptionally good. In addition to normal aircraft reconnaissance, three fixes a day from the 3rd to the 7th were provided by an aircraft flying special aircraft stress test penetrations. This aircraft and crew were from the 53rd Weather Reconnaissance Squadron at Keesler AFB, Mississippi. In addition to supplemental aircraft reconnaissance flights, radar coverage of Ellen by land stations was extensive. Radar reports from Aparri, P.I. (WMO 98231), Kaohsiung, China (WMO 46744) and the Royal Observatory, Hong Kong (WMO 45005) provided nearly continuous coverage from the Luzon Straits to landfall near Macao.

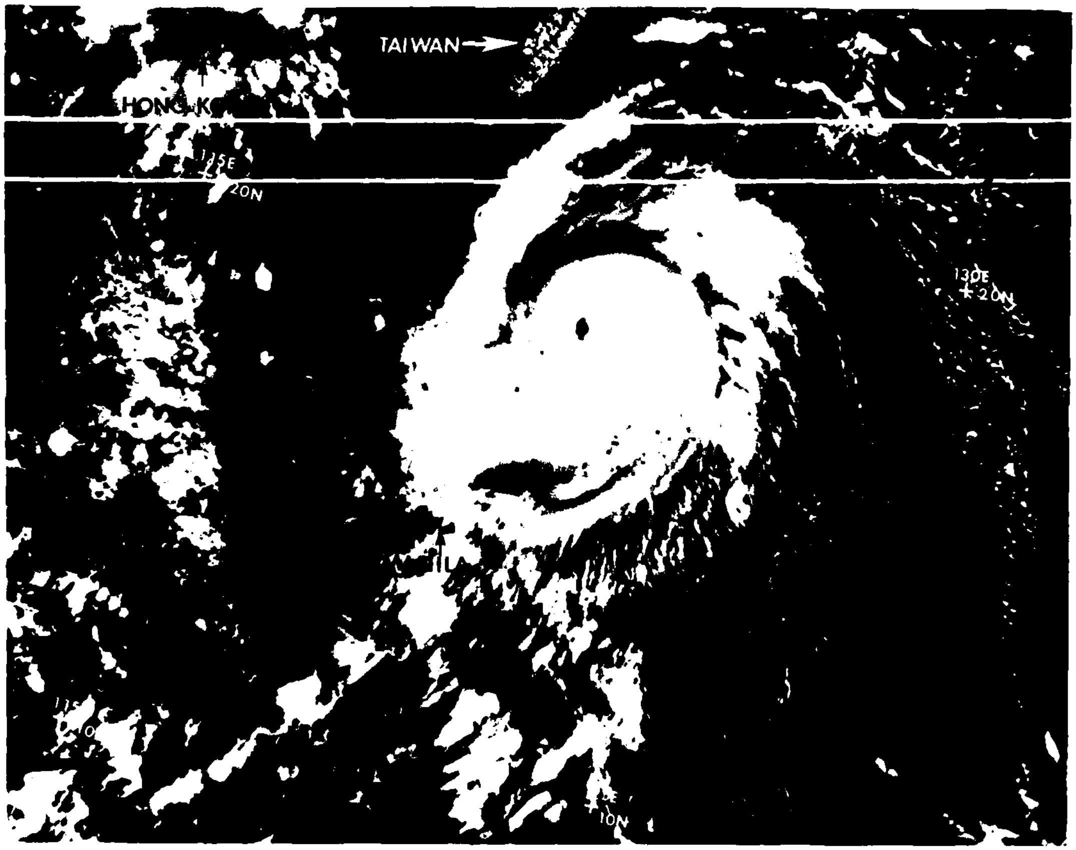
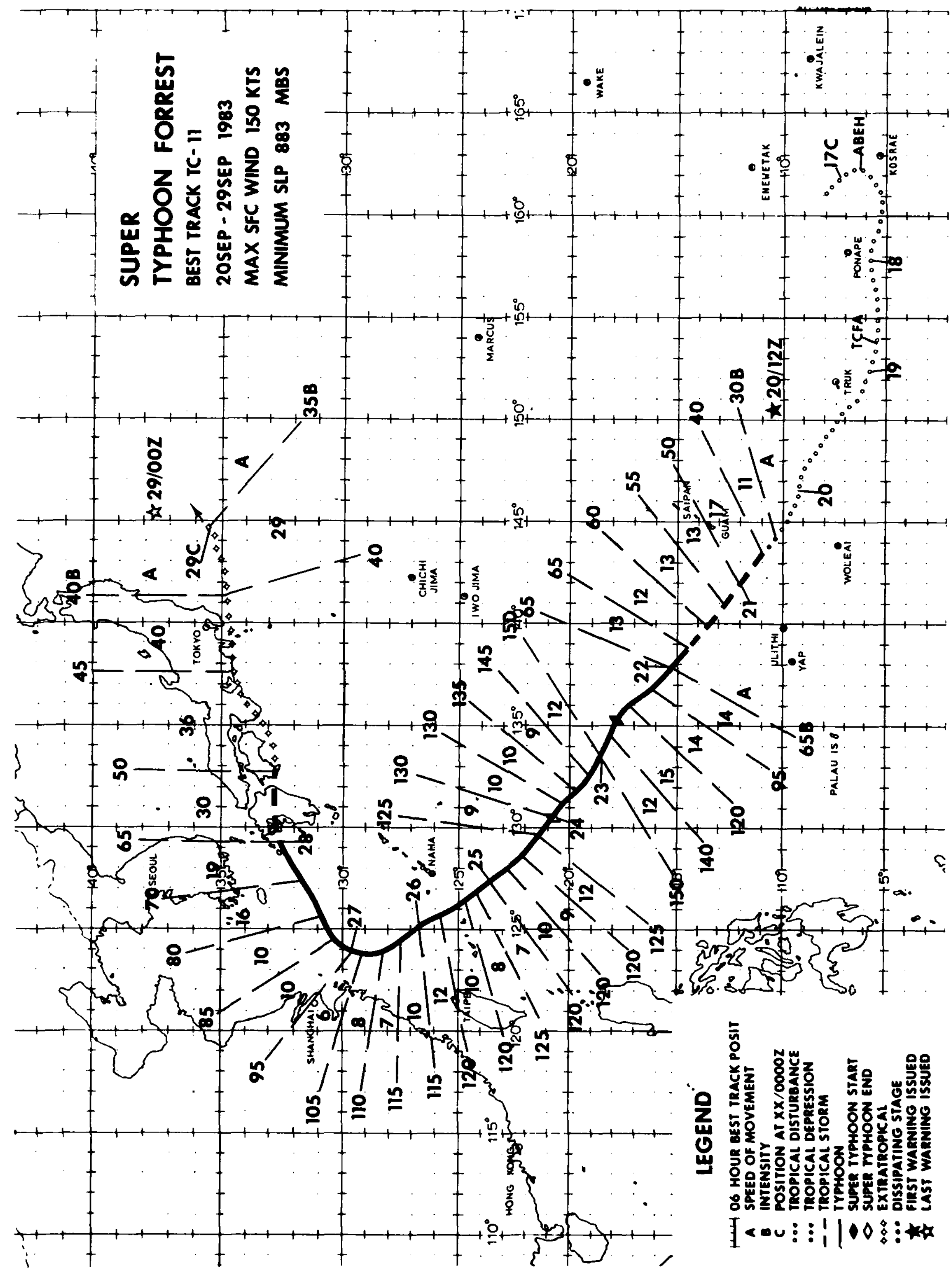


Figure 3-10-2. Typhoon Ellen at maximum intensity (060653Z September NOAA 7 visual imagery).

Ellen made landfall just south of Macao at 0000Z on the 9th of September. Maximum sustained winds at landfall were 65 kt (33 m/s) with gusts to 80 kt (41 m/s). Higher winds due to channelling effects were recorded at the Royal Observatory, Hong Kong, with the highest reported at 90 kt (46 m/s) gusting to 140 kt (72 m/s).

Damages in Hong Kong were extensive. Preliminary reports indicated that six people were killed and 277 were injured, with 120 requiring hospitalization. More than 1,600 people sought emergency shelter, mostly residents of makeshift hillside dwellings swept away by high winds, flooding, and landslides. Damages to shipping were also extensive. The Hong Kong Marine Department reported that 22 ships ran aground during Ellen's passage.

After moving inland, Ellen dissipated rapidly, becoming a 30 kt (15 m/s) tropical depression within 12 hours after making landfall.


SUPER
TYPHOON FORREST
BEST TRACK TC-11
20SEP - 29SEP 1983
MAX SFC WIND 150 KTS
MINIMUM SLP 883 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
29/00Z
20/12Z
TCFA
17C
ABEH
TOKYO
SEOUL
SHANGHAI
TAIPEI
NAHA
HONG KONG
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
KWAJALEIN
ENEWETAK
KOSRAE
PONAPE
TRUK
SAIPAN
GUAM
WOLEAI
ULITHI
YAP
PALAU IS

Forrest was the most intense of all of the tropical cyclones of 1983. After taking a long time to reach tropical storm intensity, it intensified from a tropical storm to a super typhoon in 30 hours and reached a maximum intensity of 150 kt (77 m/s) (Figure 3-11-1).

Forrest developed from a tropical disturbance which originated in a broad area of convective activity located 300 nm (556 km) to the east of Ponape (WMO 91348). This disturbance was first discussed in the Significant Tropical Weather Advisory (ABEH PGTW) on the 17th of September. At this time, the disturbance had a great deal of associated convection but was not well organized. However, a reconnaissance aircraft was dispatched to the area when 24 hour pressure drops of 3 mb at nearby stations were recorded. The aircraft mission confirmed the lack of organization in the system and was not able to close off a circulation. This mission was the first of four aircraft reconnaissance flights into Forrest during the period 17-20 September. All four were unable to close off a surface circulation. However, the fourth aircraft did succeed in closing off a circulation at the 700 mb level, thereby lending credence to the theory that Forrest originated from a mid-level circulation which developed downward.

Even though aircraft reconnaissance indicated the lack of a surface circulation, a TCFA was issued for the disturbance at 181801Z when the convection associated with it began to intensify and expand. The alert was reissued 24 hours later, after the second aircraft reconnaissance mission failed to close off a surface circulation.

Figure 3-11-1. Super Typhoon Forrest at maximum intensity with 150 kt (77 m/s) winds and MSLP of 883 mb (222223Z NOAA 8 visual imagery).

The third and fourth aircraft reconnaissance missions were flown on the morning and afternoon of 20 September. Although both flights confirmed the absence of a surface circulation during the day, the first warning was issued later that evening when satellite imagery indicated the formation of a central dense overcast and good outflow to all quadrants. At this time, Forrest was located about 180 nm (330 km) south of Guam. The forecast called for continued gradual intensification and slow northwestward movement. Although this forecast track verified well, the intensity projections were far short of the mark. Reconnaissance aircraft flying a mission on the following morning encountered 50 to 60 kt (21-26 m/s) winds in Forrest's well-defined circulation. Continued intensification after this occurred rapidly. Forrest was upgraded to a typhoon at 211800Z when satellite imagery indicated a developing eye. Aircraft dropsonde data at 212340Z indicated that Forrest's central pressure had dropped to 975 mb. About 11 hours later, at 221057Z, a sea-level pressure of 883 mb was recorded. This represented a drop of 92 mb in a little under 24 hours. This is graphically displayed in a plot of Forrest's central sea-level pressure over time (Figure 3-11-2). Note the rapid drop in pressure on the 22nd.

Fortunately, Forrest's rapid intensification occurred after the system had moved well clear of Guam. Even though Forrest was relatively weak when it passed Guam, the island was subjected to winds gusting in excess of 30 kt (15 m/s) and heavy rains. About 2 inches (5 cm) of badly needed rain fell, causing minor flooding but no serious damage.

As Forrest moved northwestward and intensified, it became apparent that a recurvature scenario was developing. A break in the subtropical ridge between Taiwan and Okinawa was clearly and consistently indicated in the NOGAPS numerical prognoses. Forrest was therefore forecast to continue moving northwestward and recurve in the vicinity of this weakness. This forecast verified well except for the precise time and location of the point of recurvature. Forrest continued moving northwestward longer than expected.

Prior to recurvature, Forrest passed 107 nm (198 km) southwest of Okinawa, subjecting the island to high winds and heavy rain. Maximum sustained winds recorded at Kadena Air Base were 50 kt (26 m/s) with gusts to 74 kt (38 m/s). Rainfall totalling 11.65 inches (30 cm) resulted in flooding which caused minor damage to the installation. Other damages due to high winds were limited to minor personnel injuries and the loss of some antennas. Preliminary reports from Japanese authorities indicated that the civilian population of Okinawa weathered the storm equally well.

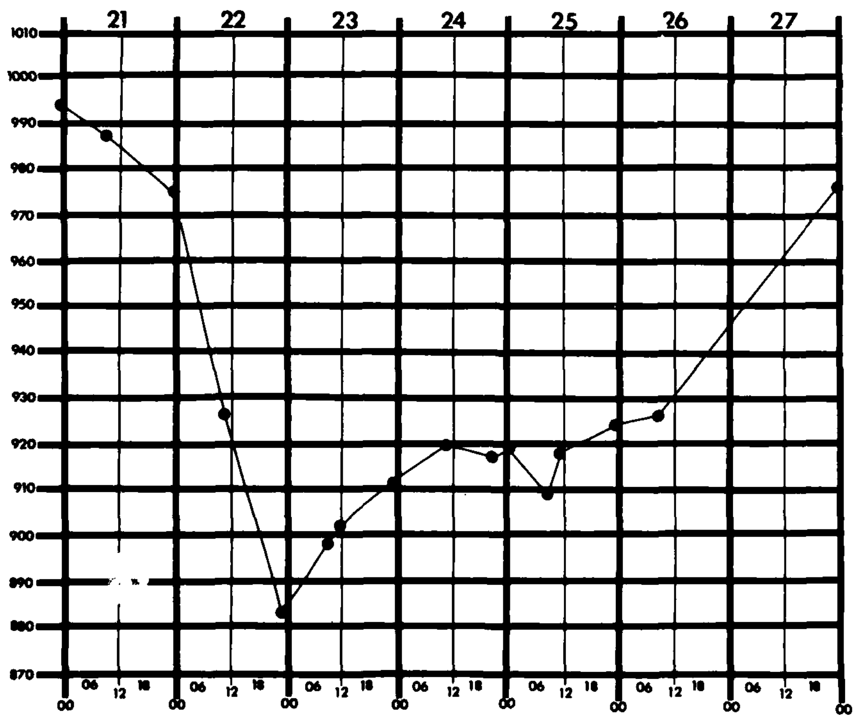


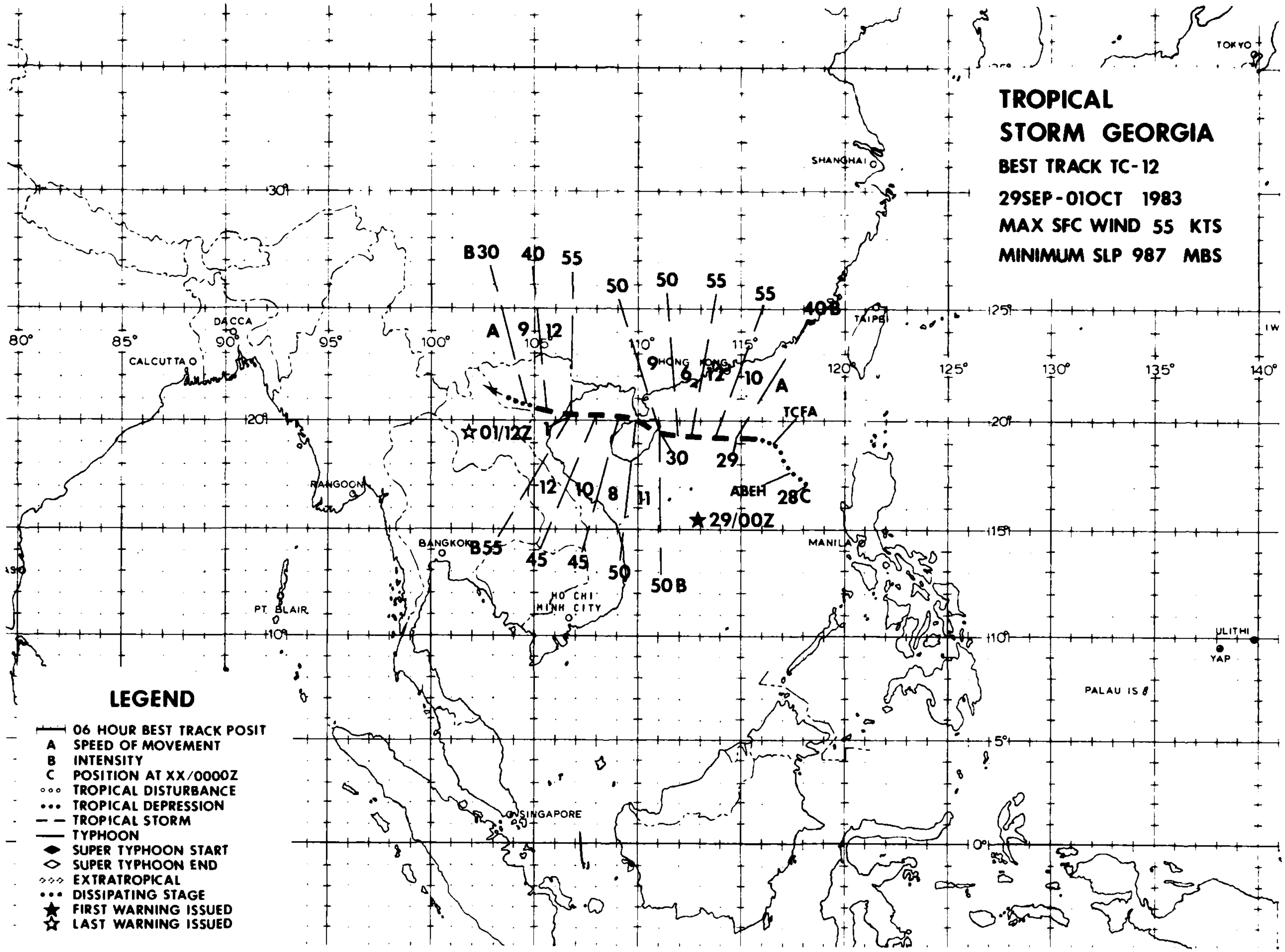
Figure 3-11-2. Intensity trends for Forrest as indicated by a plot of MSLP versus time.

Residents of Inza Island, northwest of Okinawa, were not so fortunate. A tornado, spawned during the passage of Forrest, cleared a swath 300 ft (91 m) wide across the island, destroying seven homes and injuring 26 people, some seriously. There were also reports of tornadoes over Okinawa, however, none of these touched down.

While moving past Okinawa, Forrest began to interact with a frontal system moving off the Asian continent. Within 48 hours of the onset of this interaction, satellite imagery indicated that Forrest had lost its deep convection and had begun to take on extratropical characteristics. Shortly thereafter, Forrest recurved to the east-northeast and accelerated rapidly.

Forrest weakened dramatically while undergoing extratropical transition. This was fortunate since its track during this period carried it into heavily populated areas of southern Japan at speeds up to 40 kt (74 km/hr). While crossing the island of Kyushu, Forrest passed approximately 25 nm (45 km) south of Sasebo. Inport at Sasebo were five U.S. Navy ships and several ships of the Japanese Maritime Self Defense Force. This harbor had previously been evaluated as a safe typhoon haven due to the sheltering effects of the topography in the area. This evaluation was proven correct when none of the ships in the harbor suffered damages during the passage of Forrest. Other areas in southern Japan suffered extensively from high winds and heavy rains. Initial reports indicated 21 dead, 86 injured and 17 missing. Heavy rains, up to 19 inches (48 cm) in some areas, caused numerous landslides and widespread flooding resulting in damages to 46,000 homes, some of which were total losses. The storm also stranded 28,000 travelers due to the disruption of domestic flights and rail service.

Forrest completed extratropical transition on the 28th at 0600Z while located near the southern tip of Shikoku. From this point on, Forrest continued to weaken and move rapidly toward the east-northeast as an extratropical system. Forrest was continued in warning status for an additional 18 hours until 190000Z when the final warning was issued. At this point, Forrest had cleared Japan and was moving eastward as an extratropical low with maximum sustained winds of 35 kt (18 m/s).


TROPICAL
STORM GEORGIA
BEST TRACK TC-12
29SEP-01OCT 1983
MAX SFC WIND 55 KTS
MINIMUM SLP 987 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
B30
40
55
50
50
55
55
40B
A
9
12
9
6
12
10
A
TCFA
☆01/12Z
30
29
12
10
8
11
ABEH
28C
★29/00Z
B55
45
45
50
50B
TOKYO
SHANGHAI
TAIPEI
HONG KONG
DACCA
CALCUTTA
RANGOON
BANGKOK
HO CHI MINH CITY
MANILA
PT BLAIR
SINGAPORE
ULITHI
YAP
PALAU IS
IW
80°
85°
90°
95°
100°
105°
110°
115°
120°
125°
130°
135°
140°
30°
25°
20°
15°
10°
5°
0°

The disturbance that was to become Tropical Storm Georgia originated in a broad area of convective activity located to the west of Luzon in the South China Sea. The southwesterly monsoon was well established in this area at the time, creating an area of high cyclonic vorticity at the intersection of this flow and the easterly tradewind flow at the southern periphery of the subtropical ridge. Georgia was the first of five tropical cyclones to achieve tropical storm intensity in this active monsoon trough.

The weak surface circulation which became Georgia first came to the attention of JTWC forecasters when a upper-level anticyclone formed over it on the 28th of September. This development was accompanied by a rapid increase in the organization and intensity of the circulation. A TCFA was issued at 281459Z when the increase in organization of the system, apparent from satellite imagery, was confirmed by synoptic reports indicating that the MSLP had dropped below 1003 mb.

The circulation continued to intensify rapidly through the night. When a reconnaissance aircraft investigated the area on the following morning, it encountered a tropical storm with maximum sustained winds of 40 kt (21 m/s) and an MSLP of 996 mb. The first warning on Tropical Storm Georgia was issued on receipt of the data from the aircraft at 290000Z.

Georgia tracked westward from this point on with only a slight deviation northward in the vicinity of Hai-Nan island due to topographical effects. This track was accurately predicted by most objective techniques available to JTWC forecasters. A strong subtropical ridge to the north of Georgia was expected to build westward during the period and keep the storm on a westward track. Daily height change analyses at 500 and 700 mb indicated that the ridge was indeed building as expected, causing Georgia to continue moving westward.

Georgia intensified to a maximum intensity of 55 kt (28 m/s) 12 hours prior to landfall on Hai-Nan island (Figure 3-12-1). The passage over Hai-Nan weakened Georgia slightly causing it to enter the Gulf of Tonkin with an intensity of 45 kt (23 m/s). However, Georgia reintensified while crossing the Gulf and made landfall on the coast of Vietnam with an intensity of 55 kt (28 m/s).

The timing and location of Georgia's arrival in Vietnam amplified the damages wrought by the storm. Georgia struck a low-lying agricultural area, Bac Bo, when the tide was rising and the rice crop was in the earing stage. Preliminary estimates of losses included 26 dead, 7,000 buildings damaged or destroyed and the loss of 247,000 acres (100,000 hectares) of rice. In surrounding areas, the arrival of Georgia proved beneficial. The rainfall associated with the storm, 13 to 14 inches (33 to 36 cm) in Thai Binh and Ha Nam provinces, signalled the end of an extensive drought. Rainfall associated with Georgia provided sufficient water to allow the cultivation of additional acreage for rice and filled lakes and reservoirs which could be used for irrigation of the winter and spring rice crops.

After making landfall, Georgia continued westward and dissipated rapidly in the mountains near the Laos/Vietnam border.

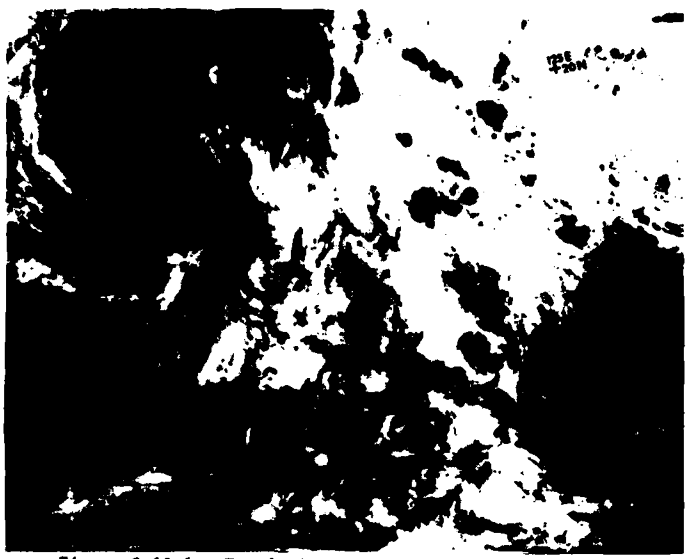
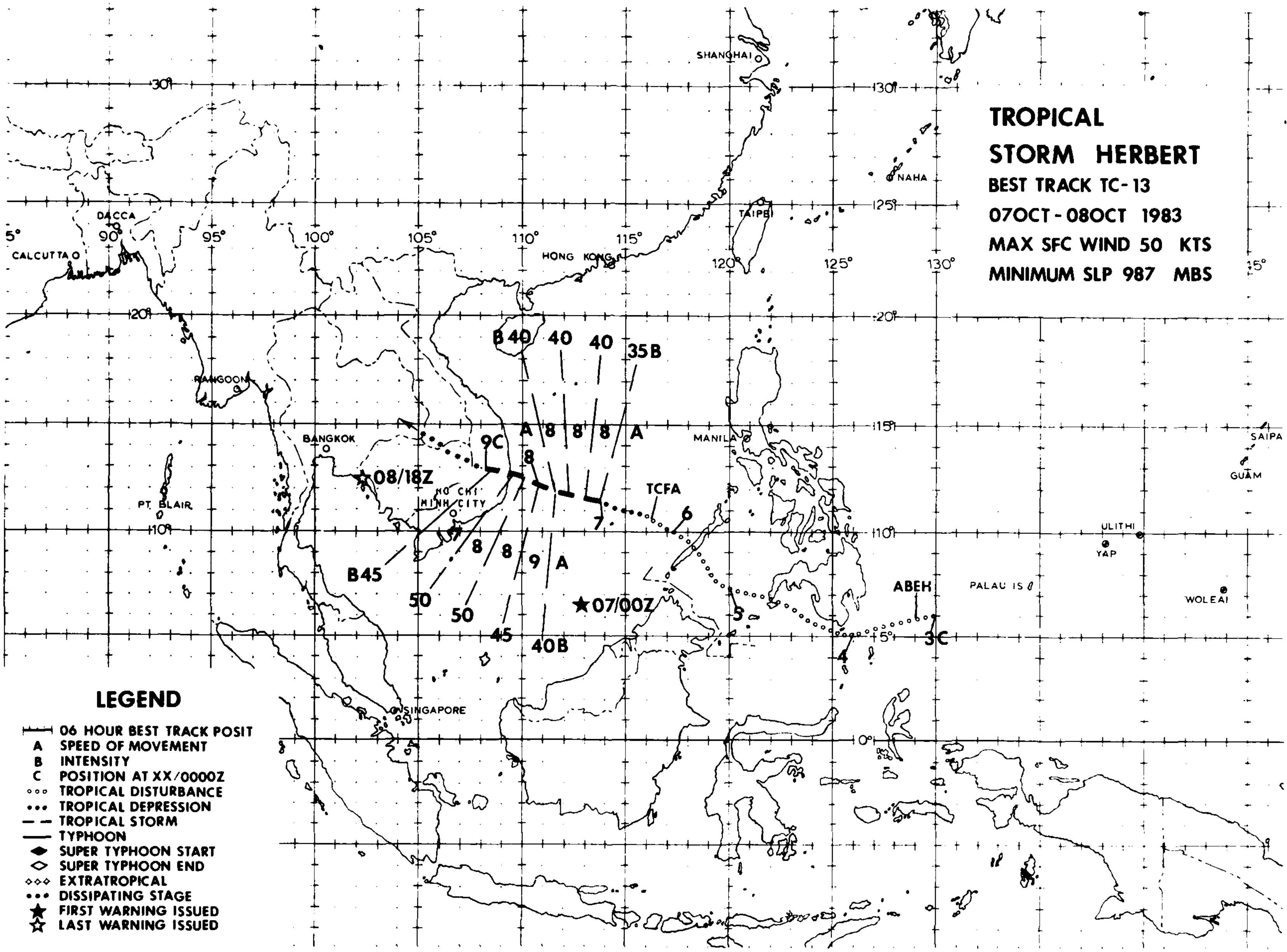


Figure 3-12-1. Tropical Storm Georgia at maximum intensity in the South China Sea (upper left). The disturbance in the lower right was the subject of a TCFA but did not develop (291026Z September DMSP infrared imagery).


TROPICAL
STORM HERBERT
BEST TRACK TC-13
07OCT-08OCT 1983
MAX SFC WIND 50 KTS
MINIMUM SLP 987 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
RANGOON
CALCUTTA
DACCA
PT. BLAIR
HO CHI MINH CITY
SINGAPORE
ULITHI
YAP
PALAU IS
WOLEAI
GUAM
SAIPA
TCFA
ABEH
07/00Z
08/18Z

TROPICAL STORM HERBERT (13W)

Tropical Storm Herbert formed from a tropical disturbance which was first observed on 3 October as an area of unorganized convective activity located 250 nm (463 km) east of Mindanao. At this time, a weak surface circulation was apparent in the synoptic wind field associated with this convection. Maximum sustained surface winds were 15 kt (8 m/s) and the MSLP was 1010 mb. In spite of the apparent weakness of this disturbance, it was closely monitored by JTWC because a TUTT cell located to the north of the disturbance provided a favorable environment for the establishment of outflow channels.

Convective activity associated with this disturbance remained high over the next three days as the circulation moved westward over the Philippines but there was no increase in the intensity of the system until it emerged in the South China Sea. On the 6th of October, the disturbance entered an area of strong southwesterly monsoon flow and began to intensify. Satellite imagery at the time indicated the formation of convective banding in spite of the fact that upper-level flow was northeasterly and no longer highly divergent. A TCFA was issued at 060700Z on the basis of the increase in organization apparent from satellite imagery. Figure 3-13-1 shows Herbert at the time the alert was issued.

The system continued to intensify over the next 18 hours. At 070019Z, a reconnaissance aircraft was able to locate a well-defined surface circulation with 35 kt (18 m/s) winds, prompting the first warning by JTWC valid for 070000Z. Forecasts for Herbert anticipated continued west-northwestward movement and minimal intensification prior to landfall on the coast of Vietnam. This scenario proved correct as Herbert achieved a maximum intensity of 50 kt (26 m/s) six hours prior to landfall north of Nha Trang, Vietnam at 081200Z. Herbert dissipated rapidly over the mountainous terrain of central Vietnam but persisted as an area of enhanced convection and reduced surface pressures for several days as it moved westward over Indochina.

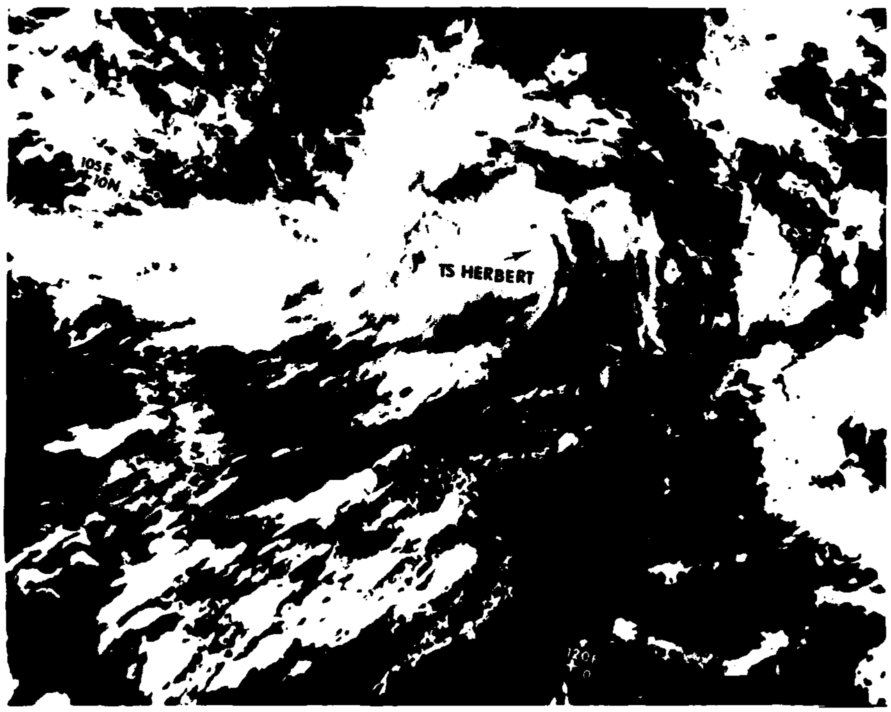
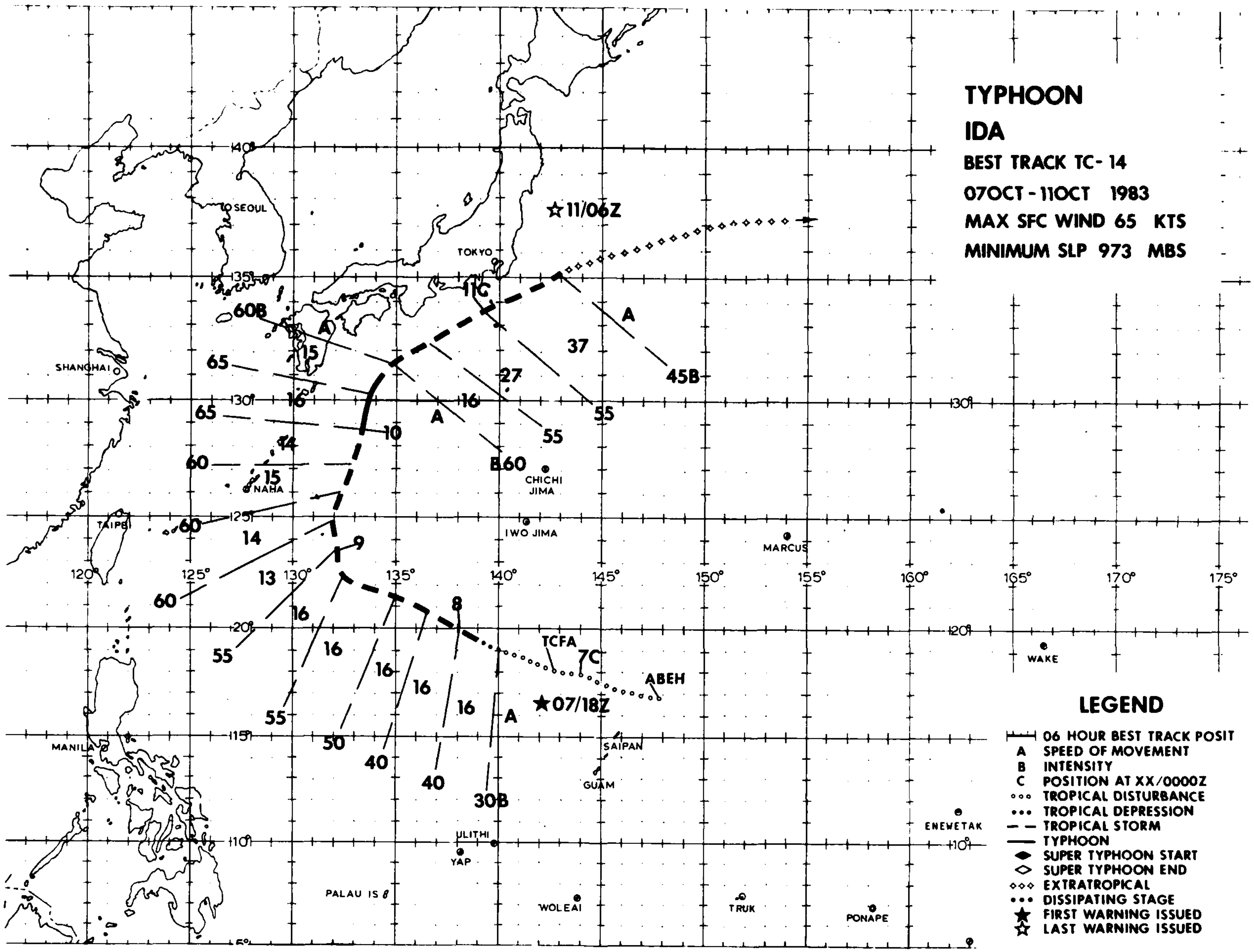


Figure 3-13-1. Herbert as a tropical depression in the South China Sea (060730Z NOAA 7 visual imagery).



TYPHOON
IDA
BEST TRACK TC-14
07OCT - 11OCT 1983
MAX SFC WIND 65 KTS
MINIMUM SLP 973 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
☆11/06Z
★07/18Z
TCFA
7C
11C
ABEH
SEOUL
SHANGHAI
TOKYO
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ENEWETAK
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
MANILA

The origins of Ida can be traced to an inverted trough which was first detected near Saipan (WMO 91232) using synoptic data on 6 October. Although this is the earliest point at which a reliable track can be established, there appears to be a linkage between the inverted trough and a convective cloud mass which developed approximately one week earlier in the center of a TUTT cell.

After Super Typhoon Forrest underwent extratropical transition in the vicinity of Japan, a TUTT cell located about 270 nm (500 km) west of Johnston Island (WM 91275) appeared to expand and intensify. As the frontal system, containing the extratropical remains of Forrest, passed to the north, the TUTT cell moved westward at about 10 kt (19 km/hr) and intensified. By 3 October, a mass of convective cloudiness had developed in the center of the TUTT cell near Wake Island (WMO 91245).

Over the next three days, the disturbance moved generally westward but fluctuated radically in position and intensity to the extent that it could not be reliably tracked as the same disturbance. During this period, the passage of another frontal system to the north and the formation of another TUTT cell to the southeast contributed to the confused state of the atmosphere in the area.

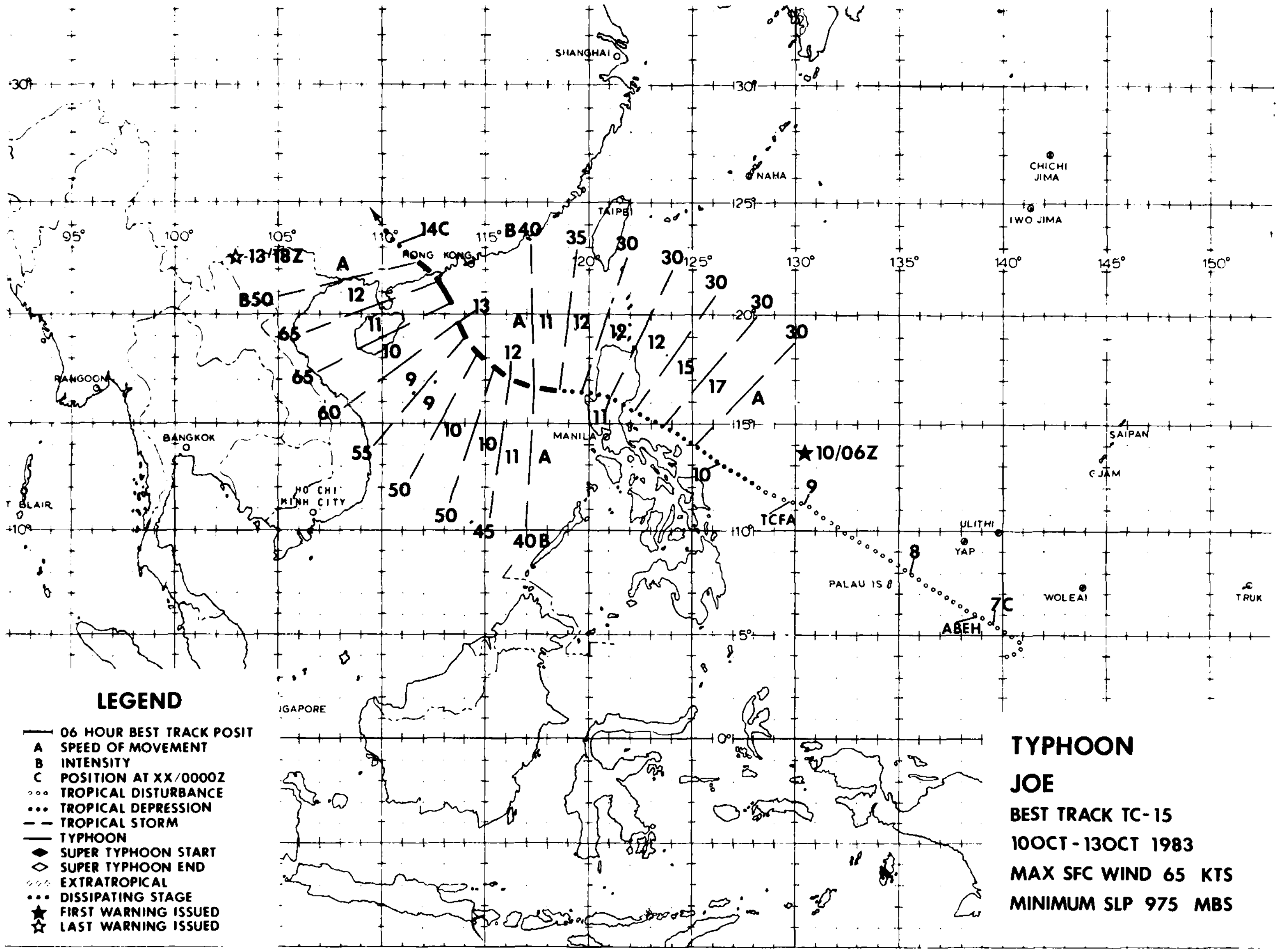
The inverted trough which was located near Saipan at 060000Z rapidly developed and became a closed circulation with 20 kt (10 m/s) winds by 061200Z. Signs of continued development, pressure falls in the area and increasing winds at nearby stations, led to the issuance of a TCFA at 070745Z.

The first warning on Ida as a tropical depression was issued at 071800Z when it became evident from satellite imagery that a central convective feature was forming. Upgrade to tropical storm status followed on the subsequent warning after reconnaissance aircraft revealed that maximum sustained winds associated with Ida had risen to 40 kt (21 m/s) and MSLP had dropped to 1000 mb.

Initial forecasts called for continued northwestward movement and intensification prior to recurvature south of Japan. Ida moved northwestward as expected and intensified, reaching a maximum intensity of 65 kt (33 m/s) on the 10th after turning north-northeastward (Figure 3-14-1). Shortly after reaching maximum intensity, Ida began to interact with a frontal system to the north. This resulted in a weakening and acceleration to the northeast as Ida underwent extratropical transition. Ida's track south of Japan was well documented by timely reports from Japanese radar stations which proved invaluable in positioning the rapidly moving system.

Although Ida passed close to the island of Honshu, approximately 80 nm (148 km) southeast of Tokyo, there were no reports of storm related damage in Japan. The small radius of high winds associated with Ida and the fact that it was weakening as it passed Japan were fortunate circumstances.

Figure 3-14-1. Ida near maximum intensity. Interaction with the frontal system to the north led to the extratropical transition and rapid acceleration of the system (092258Z October NOAA 8 visual imagery).


SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
TAIPEI
HONG KONG
RANGOON
BANGKOK
HO CHI MINH CITY
MANILA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
T BLAIR
SINGAPORE
☆13/18Z
14C
B40
B50
40B
ABEH
7C
TCFA
★10/06Z
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TYPHOON
JOE
BEST TRACK TC-15
10OCT-13OCT 1983
MAX SFC WIND 65 KTS
MINIMUM SLP 975 MBS

TYPHOON JOE (15W)

During the month of October, tropical cyclone activity in the western Pacific was concentrated in the South China Sea. Six tropical cyclones formed between 29 September and 26 October in the western Pacific. Five of the six, formed as tropical depressions in the Philippine Sea and crossed the Philippines prior to intensifying in the South China Sea. All five moved westward without recurving. Typhoon Joe (15W) was the most intense of these and the only one of the five to achieve typhoon intensity.

Joe's origins can be traced back to 6 October when it was detected as a tropical disturbance located well to the south of Guam. It was first discussed on the Significant Tropical Weather Advisor (ABEH PGTW) on the following day and was monitored by JTWC as it moved westward. At 090000Z October, synoptic data indicated that the MSLP in the disturbance was near 1006 mb and that a closed surface circulation was developing. Winds of up to 25 kt (13 m/s) were estimated from satellite analysis as convective cloudiness and organization increased. A TCFA was issued at this time in anticipation of continued intensification. The area covered by the alert was later shifted southward when satellite imagery indicated that the predominant circulation center was forming well to the south of the areas that had previously been fixed. Satellite fixes were now scattered over an area that was too large to be accounted for by either storm movement or nominal position error. The presence of multiple circulation centers was considered as a possible explanation for this excessive fix scatter.

An aircraft investigation of the area, completed at 100204Z, revealed a closed circulation center with a central pressure of 1003 mb and 30 kt (15 m/s) winds. The mission ARWO (Aerial Reconnaissance Weather Officer) reported that he suspected the presence of multiple centers, but was unable to locate any other areas of light and variable winds that would be associated with such centers.

The following aircraft reconnaissance mission also encountered perturbations in the wind field which indicated the possibility of multiple circulations. Figure 3-15-1 shows Joe as a tropical depression at the time of this mission. The arrow marks the position of the surface circulation located by aircraft. The position of the dominant circulation is not apparent from this imagery, nor is it possible to confirm the presence of multiple circulations. Synoptic data was also inadequate to afford recognition of multiple centers. Figure 3-15-2 is the surface analysis at 100000Z. Major features, such as Typhoon Ida located south of Japan, and the remains of Tropical Storm Herbert located over Indochina, are well defined. Joe appears as a tropical depression in the Philippine Sea, but data density is not sufficient to prove or disprove the presence of multiple circulations.

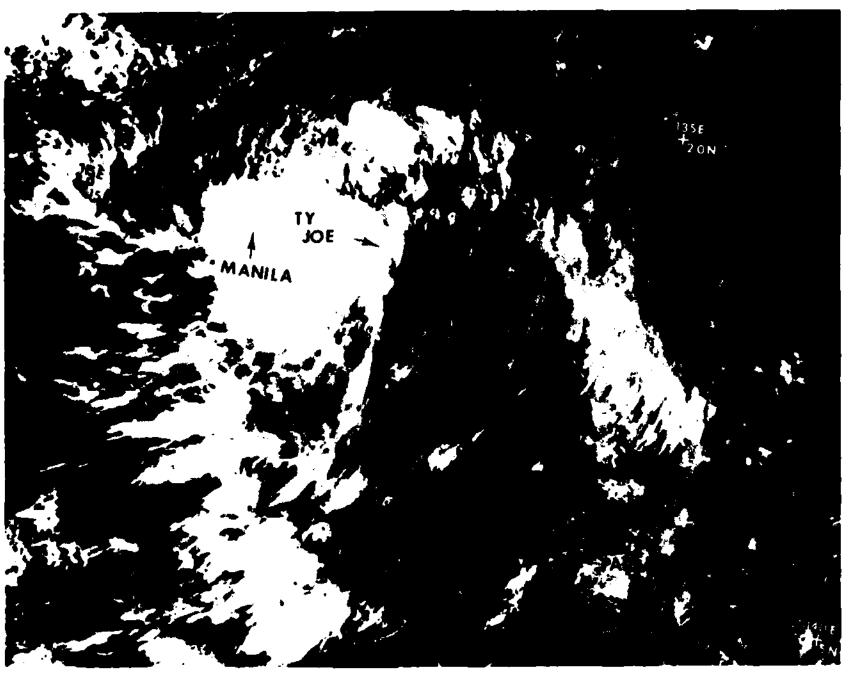


Figure 3-15-1. Satellite imagery at the time of the aircraft reconnaissance mission. (100650Z October NOAA 7 visual imagery).

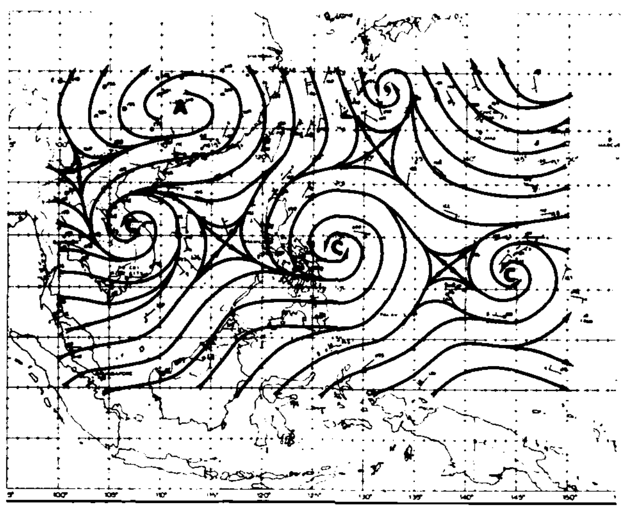


Figure 3-15-2. Surface analysis for 100000Z October showing Typhoon Ida (14W), Tropical Storm Herbert (13W), and Joe (15W) as a tropical depression in the Philippine Sea.

Joe remained poorly organized over the next 24 hours. Figure 3-15-3 illustrates the upper-level conditions which greatly affected Joe's intensity. Strong northeasterly flow to the south of the anticyclone centered near Okinawa created a shearing environment which inhibited Joe's development. This condition, combined with rapid movement over the next 24 hours, resulted in Joe approaching the Philippines as a 30 kt (15 m/s) depression with no increase in organization of intensity. As Joe crossed central Luzon, synoptic data and radar reports indicated that the system was still poorly organized.

After emerging in the South China Sea, Joe became better organized and intensified as it moved in a wide anticyclonic track around the western periphery of the subtropical ridge. Upper-level flow patterns at this time (Figure 3-15-4) were favorable for Joe's development and allowed the formation of well-defined outflow channels to the northeast and southwest. Figure 3-15-5 shows Joe near maximum intensity. Note the symmetrical and unrestricted outflow pattern.

Joe continued to intensify as it moved northwestward reaching a maximum intensity of 65 kt (33 m/s) six hours prior to landfall. Joe dissipated rapidly after moving inland over southern China approximately 100 nm (185 km) west of Hong Kong.

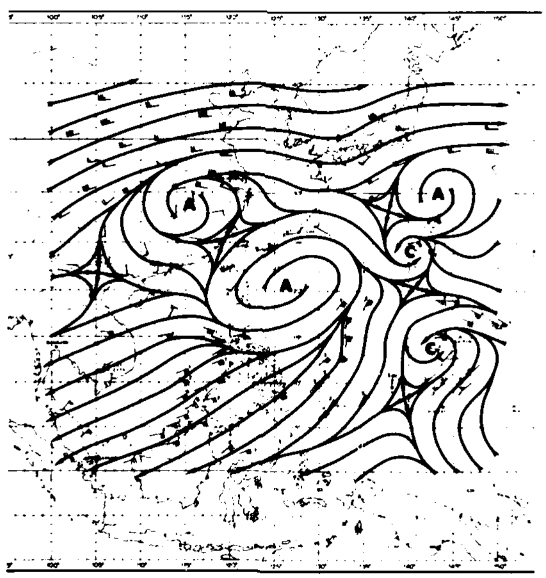


Figure 3-15-3. 200 mb analysis for 100000Z October. Note the strong northeasterly flow in the vicinity of the Philippines.

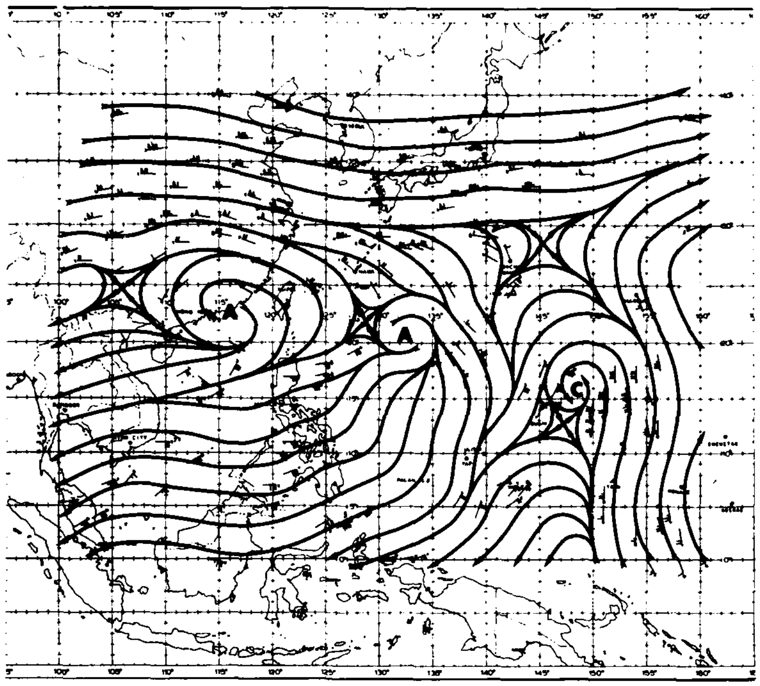


Figure 3-15-4. 200 mb analysis at 131200Z October. Comparison with Figure 3-15-3 shows a displacement of the anticyclone to the north of Joe which allowed the development of outflow channels to the northeast and southwest.

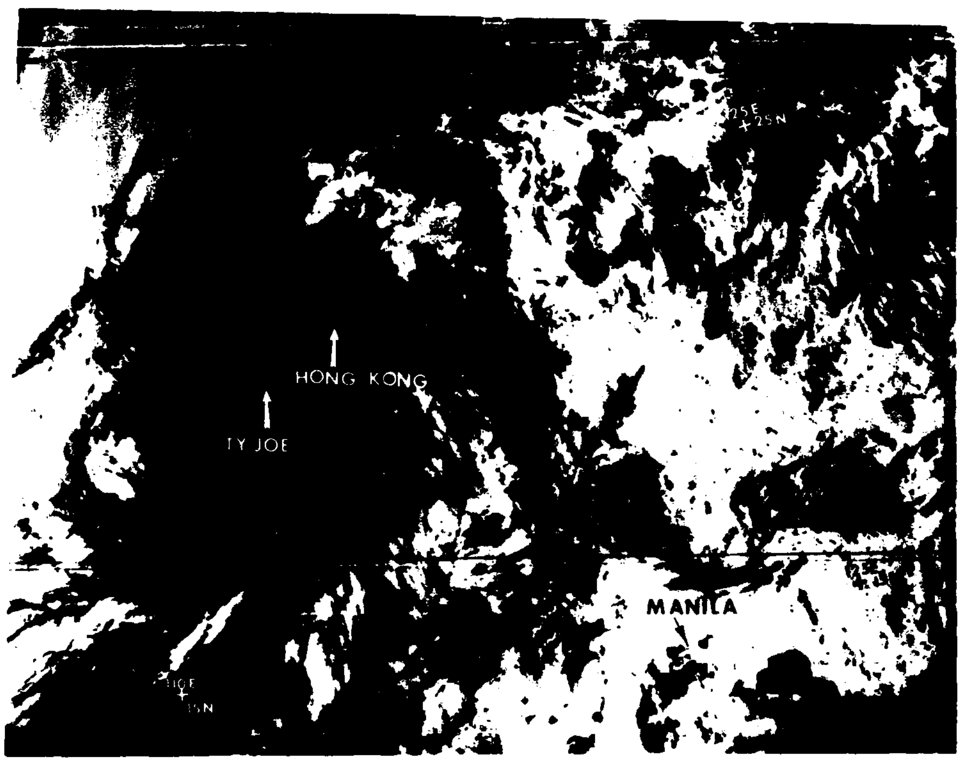


Figure 3-15-5. Typhoon Joe at maximum intensity three hours prior to landfall (131034Z October DMSP infrared imagery).

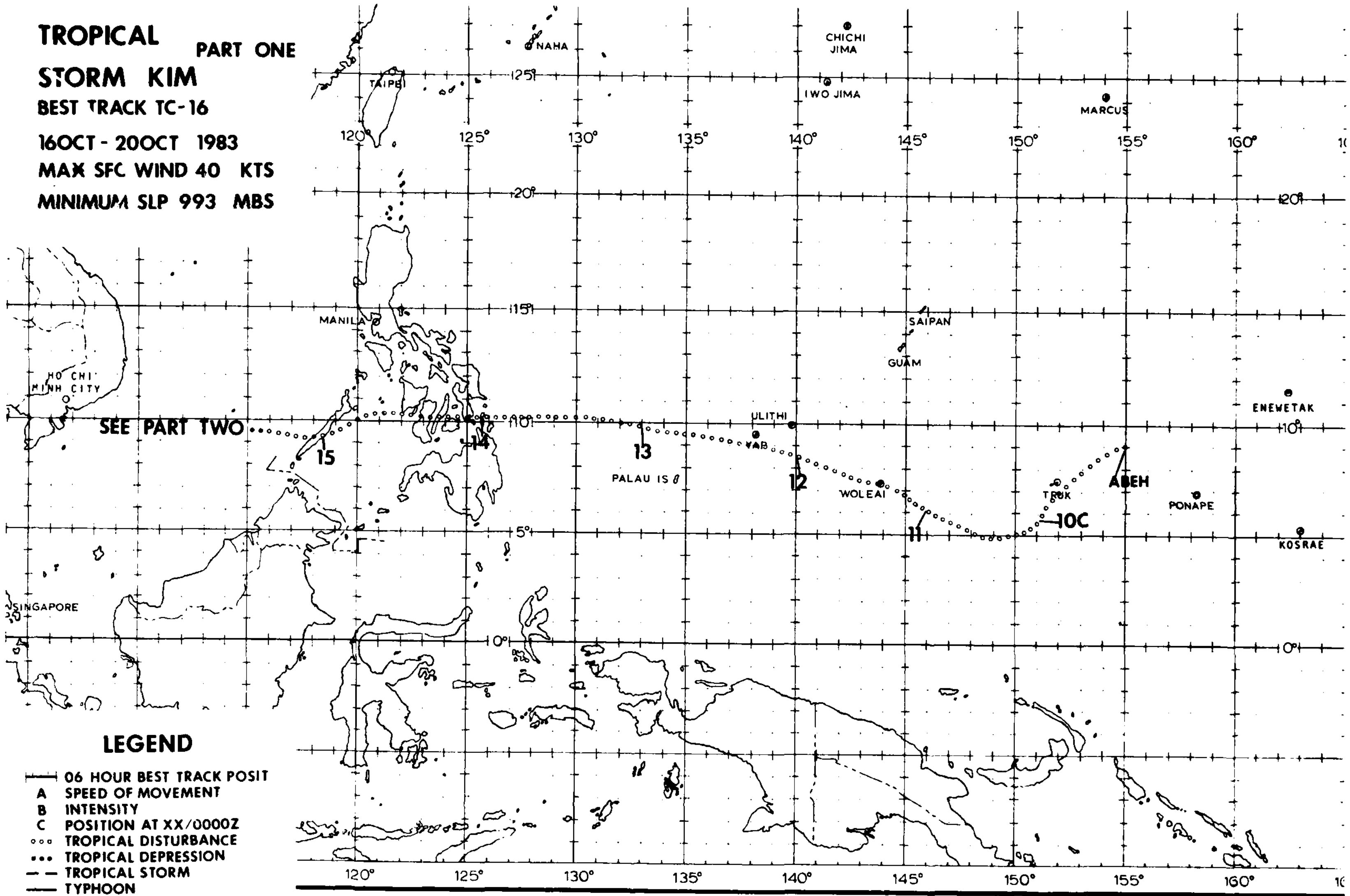
TROPICAL STORM KIM PART ONE

BEST TRACK TC-16

16OCT - 20OCT 1983

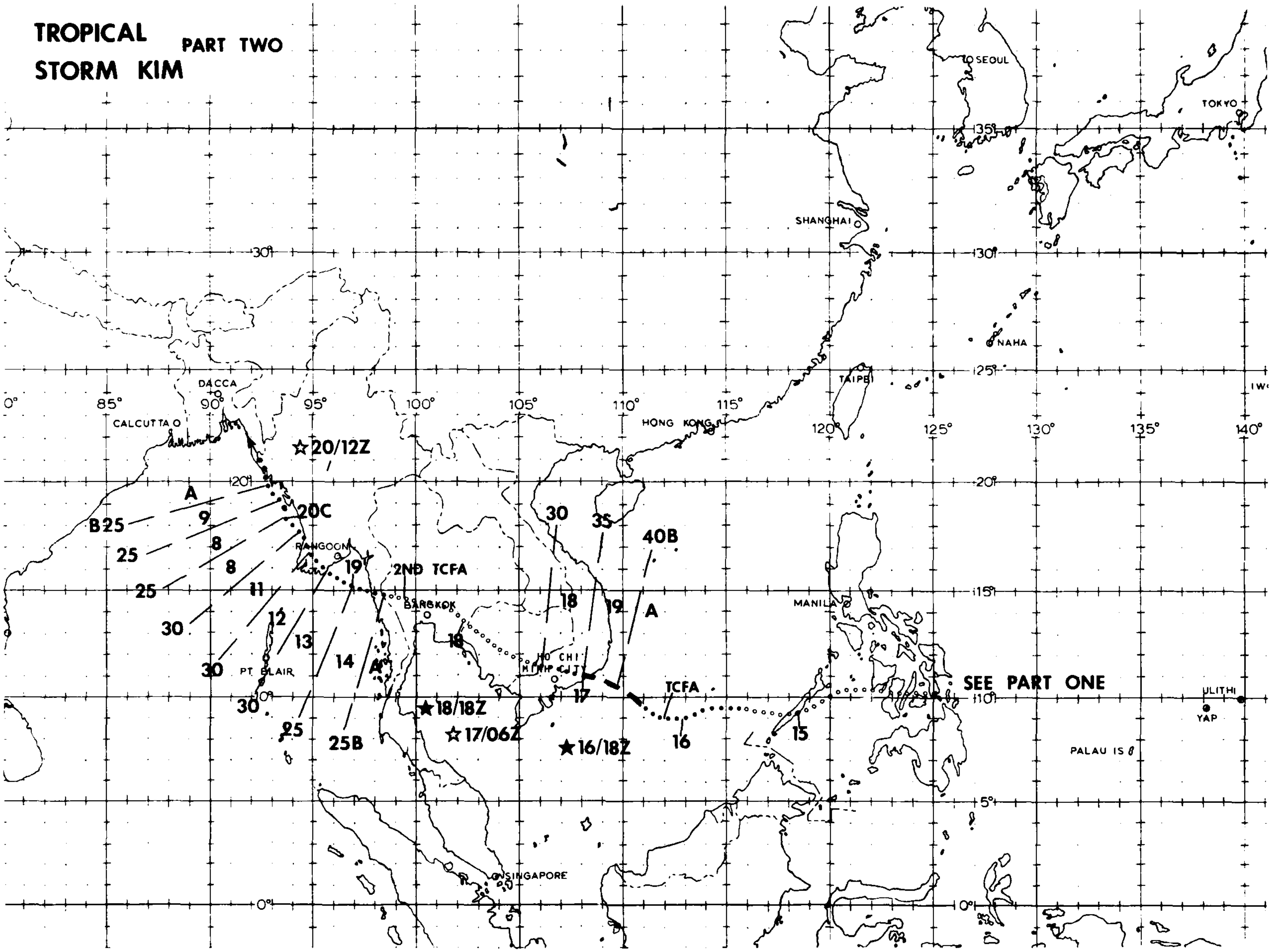
MAX SFC WIND 40 KTS

MINIMUM SLP 993 MBS



LEGEND

- 06 HOUR BEST TRACK POSIT
- A SPEED OF MOVEMENT
- B INTENSITY
- C POSITION AT XX/0000Z
- ∘∘∘ TROPICAL DISTURBANCE
- ••• TROPICAL DEPRESSION
- — — TROPICAL STORM
- —— TYPHOON
- ◆ SUPER TYPHOON START
- ◇ SUPER TYPHOON END
- ◇◇◇ EXTRATROPICAL
- ••• DISSIPATING STAGE
- ★ FIRST WARNING ISSUED
- ☆ LAST WARNING ISSUED


TROPICAL STORM KIM
PART TWO
SEE PART ONE
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
DACCA
CALCUTTA
RANGOON
BANGKOK
HO CHI MINH CITY
PT BLAIR
SINGAPORE
ULITHI
YAP
PALAU IS
☆20/12Z
2ND TCFA
TCFA
★18/18Z
☆17/06Z
★16/18Z
20C
40B
25B
B25

Tropical Storm Kim was the only tropical cyclone of 1983 to move from the South China Sea, across Indochina, and into the Bay of Bengal. This unusual meteorological event was permitted by the extremely low topographical resistance encountered along the storm's track across Indochina.

Tropical Storm Kim was initially detected on 9 October as a weak tropical disturbance located near 9N 153E. This disturbance was mentioned daily in the Significant Tropical Weather Advisory (ABEH PGTW) as it moved westward over the next four days. Although the disturbance was a persistent feature on satellite imagery, it showed no signs of development and was expected to dissipate over the southern Philippines. On the 14th of October, it appeared that the disturbance was dissipating in the vicinity of the Sulu Sea. At this point, the disturbance had lost its convective signature on satellite imagery and was no longer identifiable as a disturbance. However, on the following day, the system emerged in the South China Sea, developed rapidly into a tropical depression, and moved westward at speeds of 11 to 14 kt (6 to 7 m/s). The southwest monsoon was well-developed over the South China Sea at this time, providing an environment favorable for continued development. In view of Kim's position and the fact that several previous depressions had intensified in this environment, a TCFA was issued at 160459Z.

Kim intensified while transitting the South China Sea, reaching tropical storm intensity at 161200Z. Figure 3-16-1 shows Kim just prior to achieving tropical storm intensity near the coast of Vietnam. The first warning on Kim was issued at 161800Z, five hours prior to landfall on the coast of Vietnam.

Although Kim was a relatively weak tropical storm, its rapid development just prior to landfall resulted in much human suffering. Preliminary reports indicated that more than 200 people, most of them fishermen, died or were lost. Property damage was also unusually high, with 300 boats and ships, 3,000 houses, and 19,750 acres (8,000 hectares) of rice destroyed.

Warnings on Kim were suspended shortly after landfall as the circulation weakened rapidly over land. Kim was downgraded to a tropical depression at 170600Z as it crossed the border from Vietnam into Kampuchea. Six hours later it was classified as a tropical disturbance.

Kim continued tracking across Indochina with a great deal of associated convection and some indications of a middle to lower level circulation apparent in visual satellite imagery. Kim's ability to maintain its intensity during this period may be attributed to the flat terrain encountered along its track and the fact that it was never more than 100 nm (185 km) from water.

A second TCFA was issued for Kim at 181359Z when it became apparent that the disturbance would move into the Andaman Sea where regeneration was considered likely. Warnings for Kim were resumed on the following day as tropical depression intensity was achieved over the Andaman Sea (Figure 3-16-2). At this time, Kim was expected to cross the southern tip of Burma and further intensify in the Bay of Bengal. Kim moved across southern Burma as expected but never actually got out over open water in the Bay of Bengal. Instead, Kim moved northward along the coast of Burma, parallel to the axis of the Arakan Mountain Range, and weakened steadily. The final warning was issued as the system dissipated on the 20th at 1200Z.

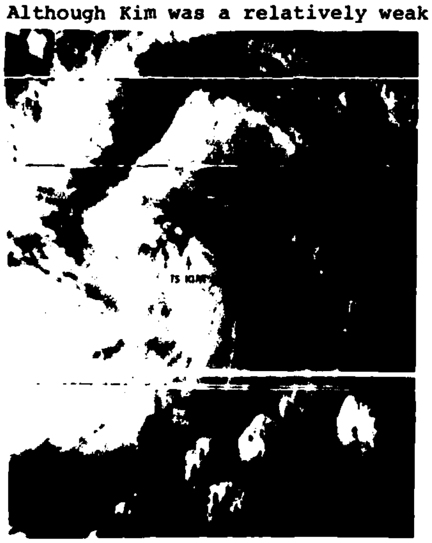


Figure 3-16-1. Kim as a tropical depression just prior to reaching tropical storm intensity off the coast of Vietnam (160708Z October NOAA 7 visual imagery).

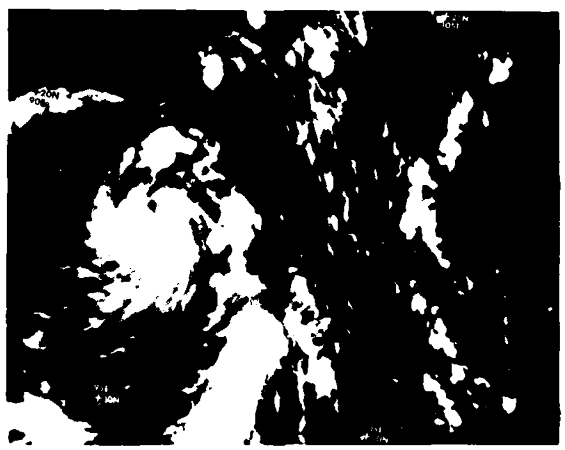
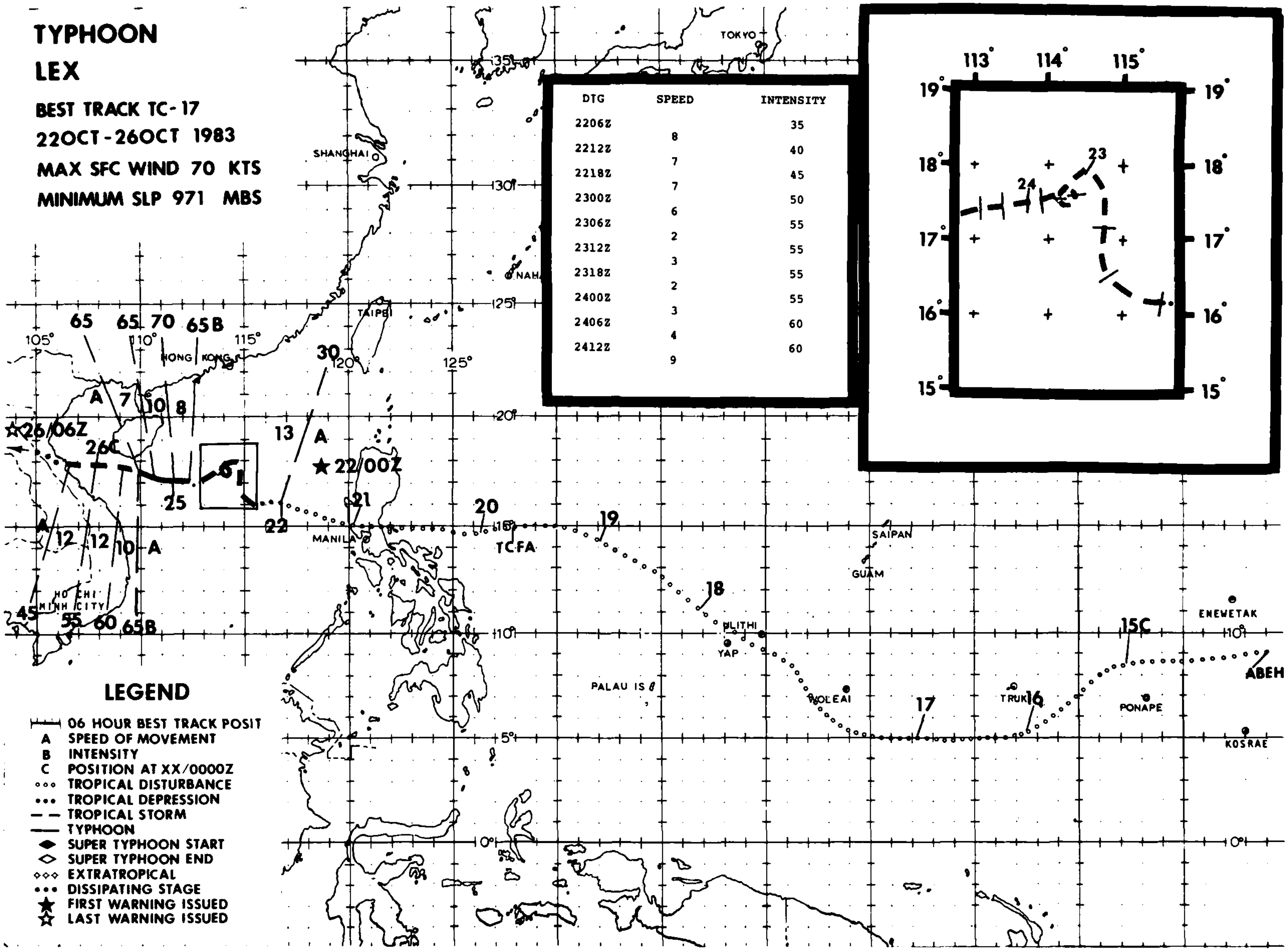


Figure 3-16-2. Tropical Cyclone 16W (Kim) after regeneration in the Andaman Sea (190821Z October NOAA 7 visual imagery).



TYPHOON
LEX
BEST TRACK TC-17
22OCT-26OCT 1983
MAX SFC WIND 70 KTS
MINIMUM SLP 971 MBS
DTG SPEED INTENSITY
2206Z 35
8
2212Z 40
7
2218Z 45
7
2300Z 50
6
2306Z 55
2
2312Z 55
3
2318Z 55
2
2400Z 55
3
2406Z 60
4
2412Z 60
9
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
SHANGHAI
TAIPEI
HONG KONG
MANILA
HO CHI MINH CITY
NAHA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENEWETAK
KOSRAE
TCFA
ABEH
22/00Z
26/06Z

TYPHOON LEX (17W)

The tropical disturbance which became Lex was extremely slow in developing and achieved Typhoon intensity for a period of only one day. Yet it was one of the most damaging cyclones of the season, responsible for the loss of a ship in the South China Sea and extensive suffering in central Vietnam where it eventually made landfall.

Lex was monitored as a tropical disturbance for eight days prior to issuance of the first warning on the system as a tropical depression. It was first detected in the vicinity of the Marshall Islands on 14 October when satellite imagery revealed the presence of an area of active convection near 9N 164E. Synoptic data in the area at this time indicated that there was not a surface circulation associated with the disturbance but did indicate a 24-hour drop of one to two millibars in sea-level pressure at nearby stations.

The disturbance underwent diurnal fluctuations in its convection as it moved westward but showed no signs of increasing in intensity until the 16th. On the 16th, while located near Truk (WMO 91334) at 5N 151E, an upper-level anticyclone began to develop over the disturbance and the system became better organized.

Over the next three days, the disturbance continued to intensify slowly as it moved westward across the Philippine Sea. Satellite imagery during this period indicated that the upper-level anticyclone was continuing to develop and that convective activity associated with the disturbance was increasing in size, organization, and intensity. Synoptic data indicated the presence of a weak 10 to 15 kt (5 to 8 m/s) surface circulation with an MSLP of 1008 mb.

A TCFA was issued for this disturbance at 192000Z as it approached the Philippines approximately 180 nm (333 km) northeast of Cataduenas Island. A reconnaissance aircraft was dispatched to the area at this time but was unable to close off a surface circulation. The alert was reissued twice as JTWC monitored the progress of this disturbance while it was crossing the central Philippines. The topography of the Philippine Islands had little effect on the disturbance and it emerged in the South China Sea with no appreciable decrease in its organization.

Lex began to intensify while moving west-northwestward away from Luzon. The first warning on Lex was issued on the 22nd at 0000Z when satellite imagery indicated that the cloud bands associated with the system were taking on a comma-shaped appearance. Although Lex was designated as a tropical depression on the initial warning, upgrade to tropical storm status followed quickly when a reconnaissance aircraft encountered 35 kt (18 m/s) winds while fixing the system at 220535Z.

Lex was expected to continue intensifying slowly and move west-northwestward toward Hai-Nan island along the southern periphery of the subtropical ridge. This scenario appeared to be inaccurate when Lex began moving slowly northward after 220600Z. This slow northward movement culminated in a counter-clockwise loop near 17.5N 114.5E, approximately 300 nm (556 km) south of Hong Kong. The movement of Lex during this period was in response to the passage of a developing mid-level trough over China. This trough penetrated farther to the south than was expected, causing a weakness to develop in the subtropical ridge to the north of Lex. It appeared that this trough would cause a complete breakdown of the ridge to the north of Lex, allowing the storm to drift northward toward Hong Kong. Figure 3-17-1 shows the position of this trough as Lex began its cyclonic loop. The interaction of Lex with this trough was also apparent in satellite imagery at the time (Figure 3-17-2). Twelve hours after this scenario was adopted on the 230600Z warning, the subtropical ridge re-established itself to the north of Lex and the storm resumed a westward track.

Lex intensified while moving westward, reaching a maximum intensity of 70 kt (36 m/s) at 0000Z on the 25th. Gradual weakening occurred over the next 24 hours as Lex passed to the south of Hai-Nan island. The interaction of the circulation with the rugged terrain of Hai-Nan had a pronounced effect on the system. The decrease in organization and convection, apparent from satellite imagery, led to the downgrade of Lex to tropical storm status at 251800Z. Lex weakened further while transitting the Gulf of Tonkin, making landfall near Dong Hoi, Vietnam with maximum sustained winds of 50 kt (26 m/s). Lex dissipated rapidly over the rugged terrain of central Vietnam and Laos after causing extensive damage to low-lying areas in its path.

According to preliminary reports from Vietnam, areas near the point of landfall were devastated by the high winds and torrential rains associated with Lex. Damage was extensive as rivers rose six feet (2 m), resulting in widespread flooding. Hundreds of people were killed or injured, 17,000 homes were destroyed, and six hospitals were seriously damaged. In addition, an estimated 100,000 tons of starch food may have been lost due to the flooding.

Other damage caused by Lex came to light after the dissipation of the storm. The oil drilling ship, Glomar Java Sea, was operating in the vicinity of Hai-Nan island during the passage of Lex. A search was conducted for the ship after radio contact was lost during the storm. The 5,926 ton vessel was finally located using sonar under 300 ft (91 m) of water about 60 nm (111 km) south of Hai-Nan island. There have been no reports of survivors from the crew of 81.

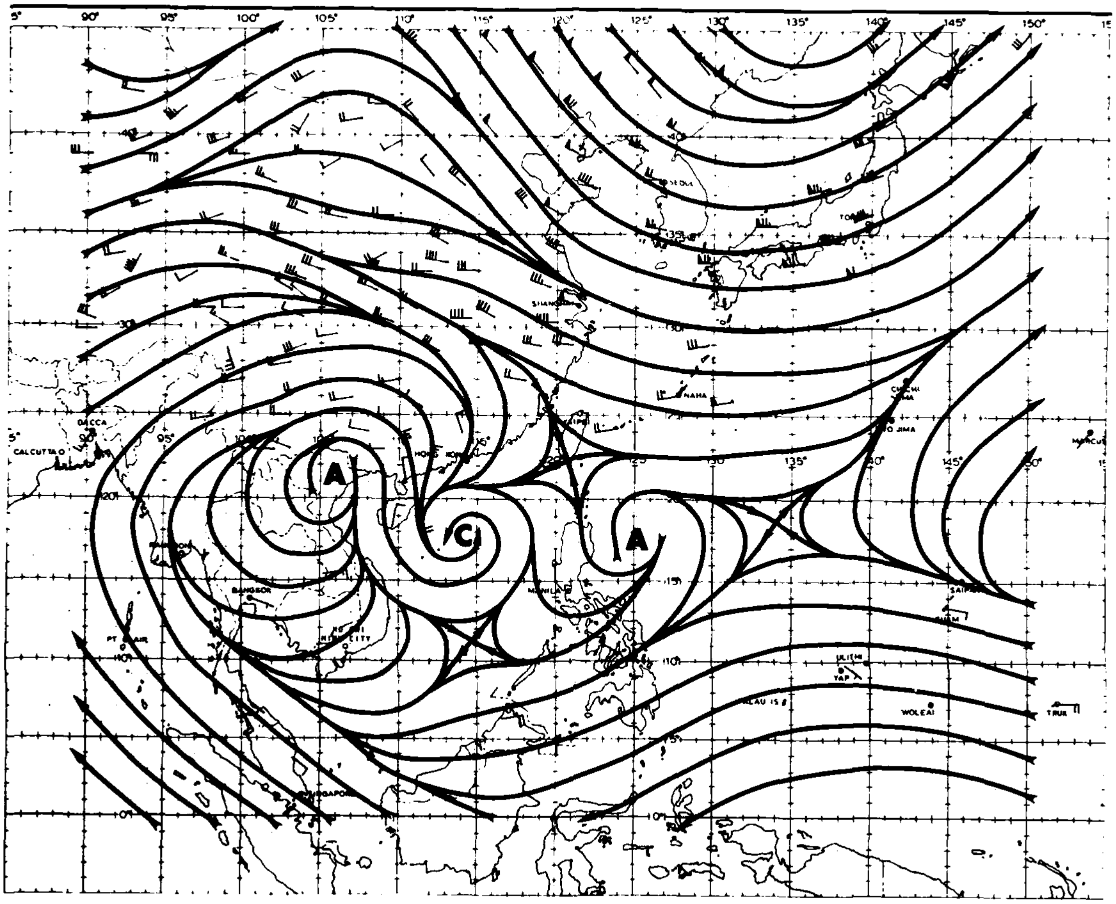


Figure 3-17-1. Orientation of the mid-level trough which briefly interacted with Lex (230000Z October 500 mb analysis).

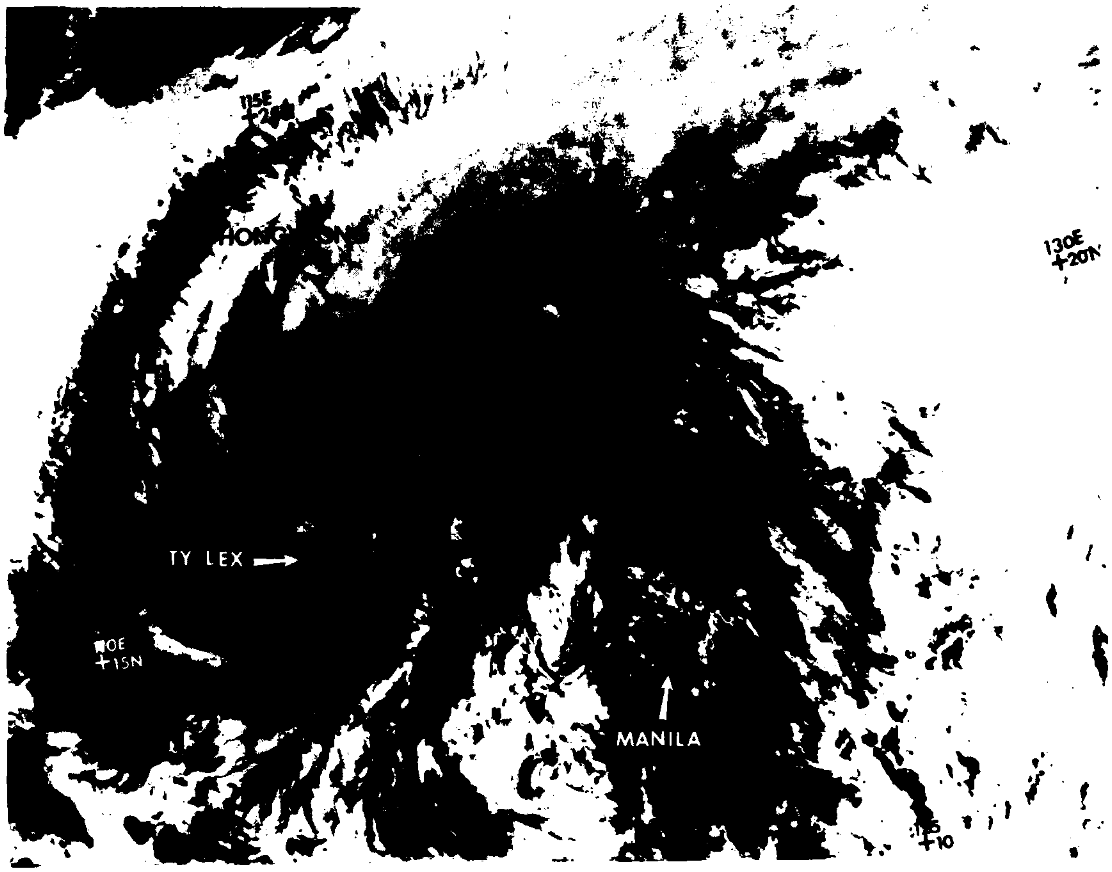
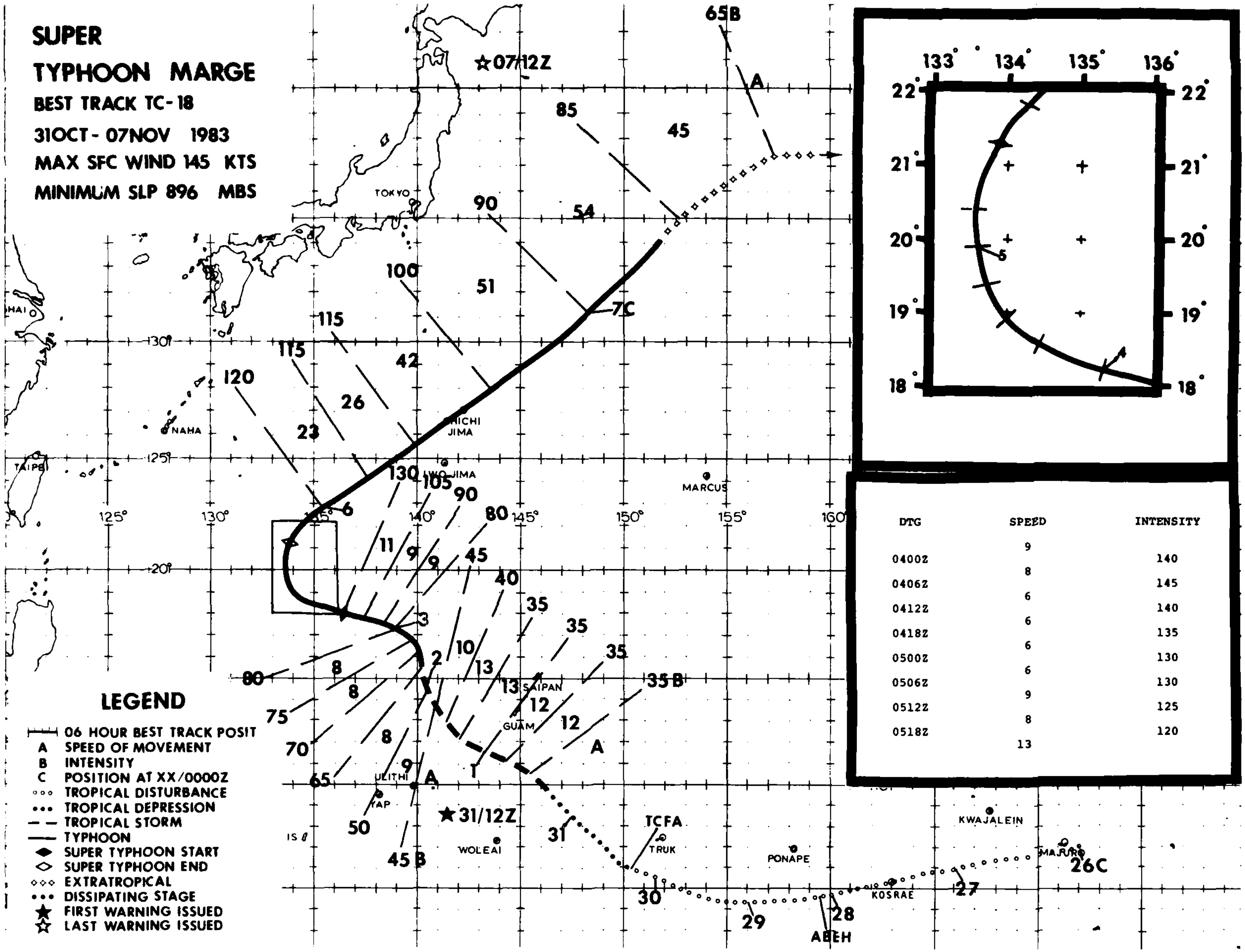


Figure 3-17-2. Lex as a tropical storm while undergoing a cyclonic loop (231026Z October DMSP infrared imagery).


SUPER
TYPHOON MARGE
BEST TRACK TC-18
31OCT - 07NOV 1983
MAX SFC WIND 145 KTS
MINIMUM SLP 896 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
DTG SPEED INTENSITY
9
0400Z 140
8
0406Z 145
6
0412Z 140
6
0418Z 135
6
0500Z 130
6
0506Z 130
9
0512Z 125
8
0518Z 120
13
TOKYO
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
KOSRAE
KWAJALEIN
MAJURO
TCFA
07/12Z
31/12Z

SUPER TYPHOON MARGE (18W)

The tropical disturbance which developed into the fourth super typhoon of the season was initially detected on 26 October as an area of unorganized convection associated with a weak surface circulation near 7N 172E. Synoptic data at the time indicated that surface winds associated with the disturbance were weak, 5-10 kt (3-5 m/s) and MSLP was 1012 mb. This disturbance organized slowly over the next four days as it moved westward along the monsoon trough axis. During this period, an upper-level anticyclone formed in close proximity to the low-level circulation. This development was accompanied by a drop in MSLP to 1008 mb and a concurrent increase in the convective activity associated with the circulation. This led to the issuance of a TCFA on the 30th at 1035Z.

During the 24 hour period following the issuance of the TCFA, satellite imagery showed that the convective activity associated with the circulation was undergoing further consolidation and that outflow channels were developing to the northeast and southwest. Synoptic data and Dvorak satellite analysis indicated maximum sustained winds of 25 to 35 kt (13-18 m/s), prompting the issuance of the first warning at 311200Z.

At this point, Marge was located 180 nm (333 km) south of Guam. The subtropical ridge in this area was expected to weaken in response to the passage of an intense mid-latitude trough. Forecasts issued during this period projected that Marge would react to the passage of this trough, moving slowly northwestward, then recurving to the northeast. Marge moved northwestward as expected, but did not recurve. By the time Marge arrived in a position to recurve in advance of the trough, the trough had already passed to the north and Marge came under the influence of low-level easterly flow associated with a high upstream of the trough. This resulted in Marge resuming a northwestward track prior to subsequent recurvature in advance of another mid-latitude trough.

Premature adoption of the recurvature scenario greatly affected the accuracy of the intensity forecasts. Marge achieved typhoon intensity on 2 October at 0600Z. This was not far from the forecast intensity for this time. However, two days later, on the 4th, Marge was a 145 kt (75 m/s) super typhoon. Since, by the 4th, Marge was initially expected to be weakening after recurvature, unusually large intensity errors occurred.

Shorter range intensity forecasts met with greater success. Use of an objective aid for the prediction of explosive deepening (Dunnavan, 1981) resulted in fairly accurate 24 hour intensity forecasts verifying at maximum intensity. At 0600Z on the 3rd, this technique predicted that Marge would undergo explosive deepening. Within 24 hours of this prediction, Marge's intensity increased from 90 kt (46 m/s) to 145 kt (75 m/s). Marge did not recurve initially as forecast and, when recurvature did occur, moved at speeds much higher than anticipated while rapidly

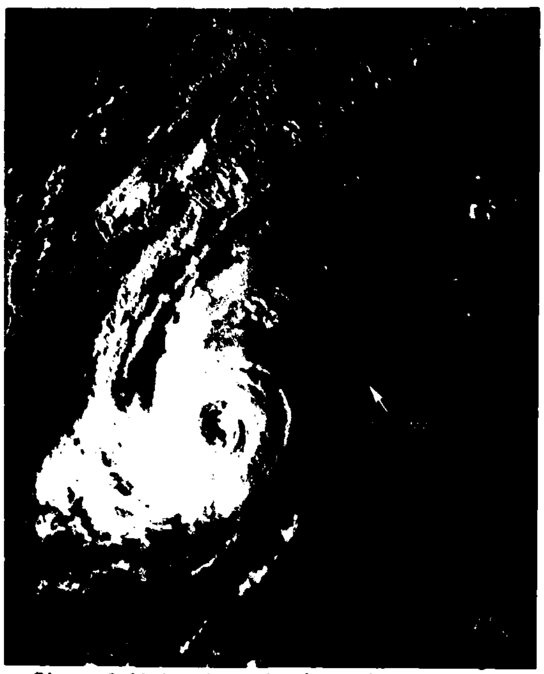


Figure 3-18-1. Marge in the early stages of recurvature. At this point, maximum sustained winds were 115 kt (59 m/s) and speed of movement was 25 kt (46 km/hr) (060617Z November NOAA 7 visual imagery).

evolving into an extratropical system. This resulted in large position errors. Figure 3-18-1 and 3-18-2 give some indication of the rapidity with which Marge underwent extratropical transition. Although there is only 17 hours elapsed time between the two pictures, there is a striking difference in Marge's appearance. In Figure 3-18-1, Marge appears as a well developed typhoon with a circular eye and maximum sustained winds of 115 kt (59 m/s). In Figure 3-18-2, Marge is nearing the end of its transition to an extratropical system while moving northeastward at a speed of 51 kt (95 km/hr).

Marge's high speed of movement during recurvature was phenomenal. At 051200Z, the forecast called for recurvature with acceleration to a maximum speed of 35 knots. This forecast predicted that Marge would more than quadruple its speed of forward motion since the storm was only moving at 8 kt (15 km/hr) at the time. However, this forecast fell far short of the 54 kt (100 km/hr) speed actually attained by Marge.

Marge's high speed of movement following recurvature contributed to the deformation of the wind field associated with the storm. Marge became very asymmetric, with winds in its southeast semicircle much higher than winds in the northwest semicircle. This was due to the addition of its speed of translation to the circulation wind field on the southeastern side and the corresponding decrease in winds on the northwestern side. This made it appear that Marge's circulation weakened more slowly than it actually did since the measure of the intensity of a system is the maximum surface wind, without regard to symmetry.

The asymmetric nature of Marge's wind field proved beneficial to the crew of the Colombian Navy Sailing Ship ARC Gloria. Gloria was fortunate enough to encounter the weak northwestern portion of Marge's circulation. Even so, Gloria reported seas to 30 ft (9 m) and winds gusting to 90 kt (46 m/s) as Marge passed to the southeast. The high winds and heavy seas encountered by Gloria resulted in the injury of three crewmen, the loss of a motor boat and five sails, and minor structural damage.

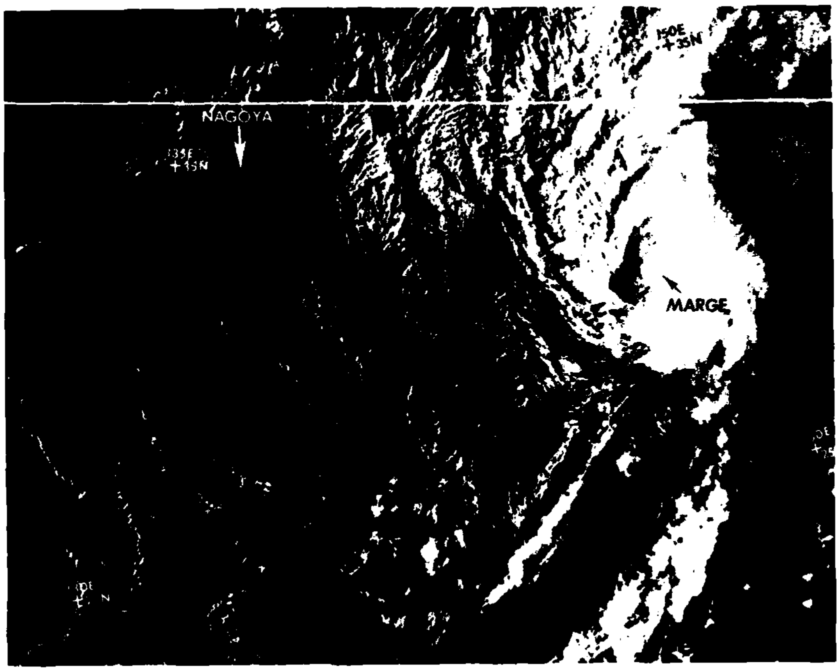
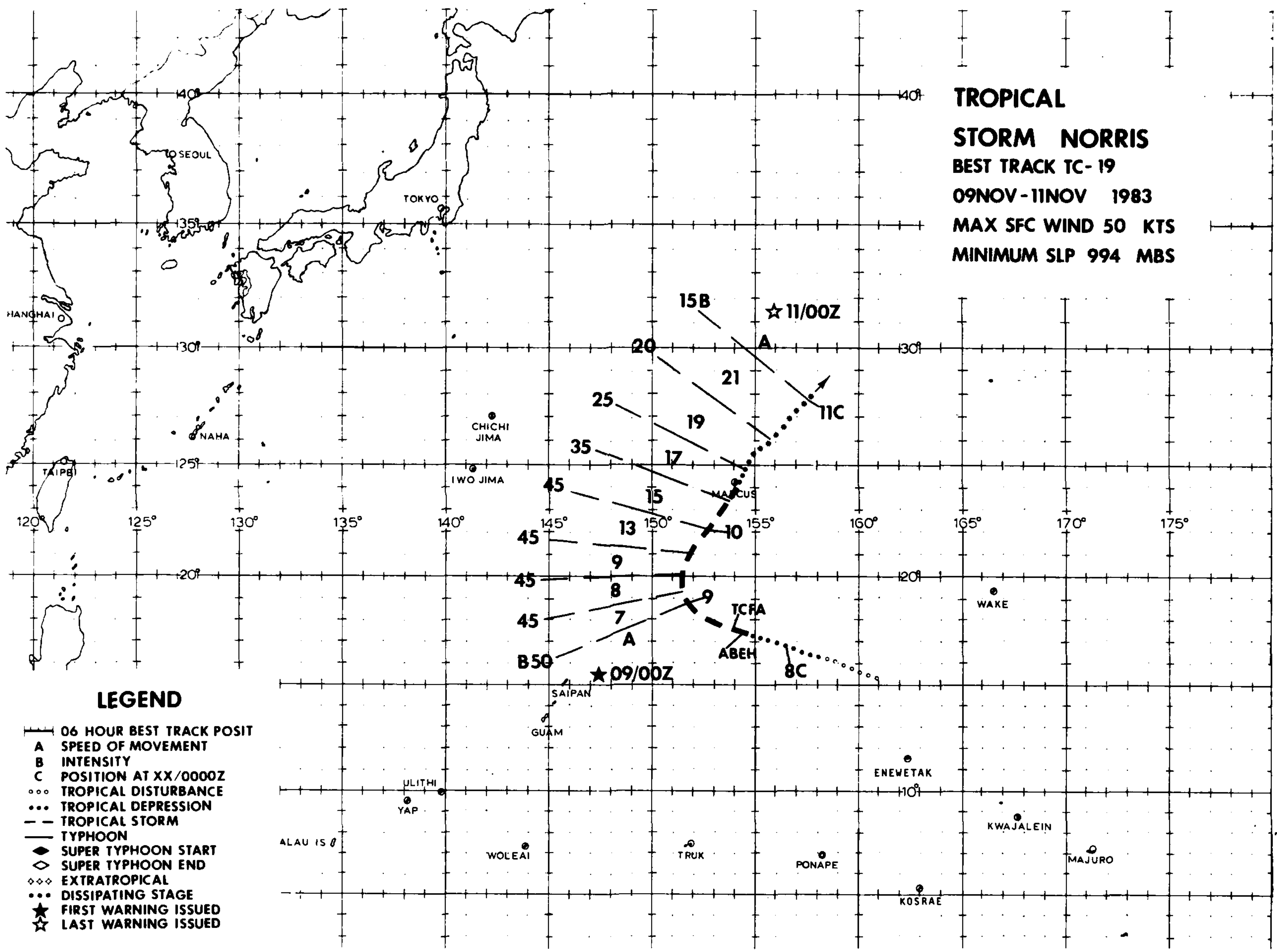


Figure 3-18-2. Marge just prior to completing transition to an extratropical system. Maximum sustained winds were 90 kt (46 m/s) and speed of movement was 51 kt (95 km/hr) (062254Z November NOAA 8 visual imagery).


TROPICAL
STORM NORRIS
BEST TRACK TC-19
09NOV-11NOV 1983
MAX SFC WIND 50 KTS
MINIMUM SLP 994 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
TOKYO
HANGHAI
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
ALAU IS
WOLEAI
TRUK
PONAPE
KOSRAE
ENEWETAK
KWAJALEIN
MAJURO
WAKE
15B
☆11/00Z
11C
★09/00Z
TCFA
ABEH
8C
B50

TROPICAL STORM NORRIS (19W)

On the day following the final warning on Super Typhoon Marge, a surface circulation appeared on visual satellite imagery to the east of the front associated with the remnants of Marge. This circulation was located in a data sparse area and had very little associated convective activity. Although depicted as small and unimpressive on the satellite imagery, the circulation quickly evolved into a midget tropical storm. A TCFA was issued at 080849Z when the deformation of the low-level cloud-lines on satellite imagery indicated that the circulation was well organized. A reconnaissance aircraft was dispatched on the following morning to investigate. When the aircraft arrived at the expected position of the circulation, it encountered light and variable winds with no indication of the presence of a surface circulation. Upon receipt of this report from the aircraft, the expected position was revised on the basis of updated satellite imagery and the aircraft was vectored eastward to a new position. Only 130 nm (241 km) to the east-southeast of its previous position, the aircraft encountered a well-developed tropical storm with 50 kt (26 m/s) winds and a circular eye 15 nm (28 km) in diameter. The first warning on Tropical Storm Norris was issued upon receipt of this report. Figure 3-19-1 shows Norris at the time of the reconnaissance mission. Although an eye is not apparent on satellite imagery, Norris does appear as a highly organized (though extremely small) tropical storm.

Figure 3-19-1. Tropical Storm Norris at maximum intensity just prior to recurvature. Less than 48 hours later, Norris was completely absorbed by the front which appears to the left in the picture (082211Z November NOAA 8 visual imagery).

The position of Norris, to the east of an advancing front, led to a straightforward forecast of recurvature and dissipation which verified well. Less than three days after its initial detection, Norris had been completely absorbed by the advancing front and was no longer identifiable as a distinct entity.

Post-analysis revealed that Norris developed rapidly from a pre-existing disturbance of small proportions. Figure 3-19-2 shows Norris at 080931Z, near the time of issuance of the TCFA. Although there is little convective activity associated with the circulation, the organization of the low-level wind field is evident in the alignment of the cloud lines. This low-level banding is also evident in visual satellite imagery 12 hours prior to the TCFA. However, imagery prior to that shows only a small unorganized disturbance moving rapidly northwestward. Norris' rapid development was, in part, due to favorable upper-level conditions which existed at that time. Figure 3-19-3 shows that Norris developed in an area of light but highly divergent upper-level flow.

Norris never posed a threat to any major land mass but was a subject of great concern to shipping in the area. Fortunately, Norris' movements were accurately forecasted and the ships involved were able to avoid the tiny but powerful circulation.

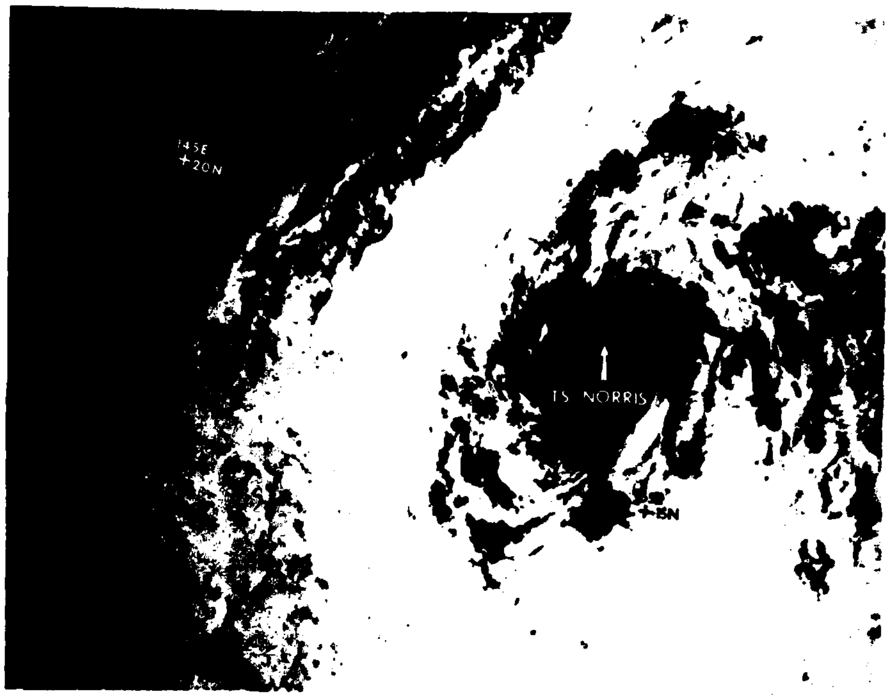


Figure 3-19-2. Norris at the time of issuance of the TCFA (080931Z November NOAA 8 infrared imagery).

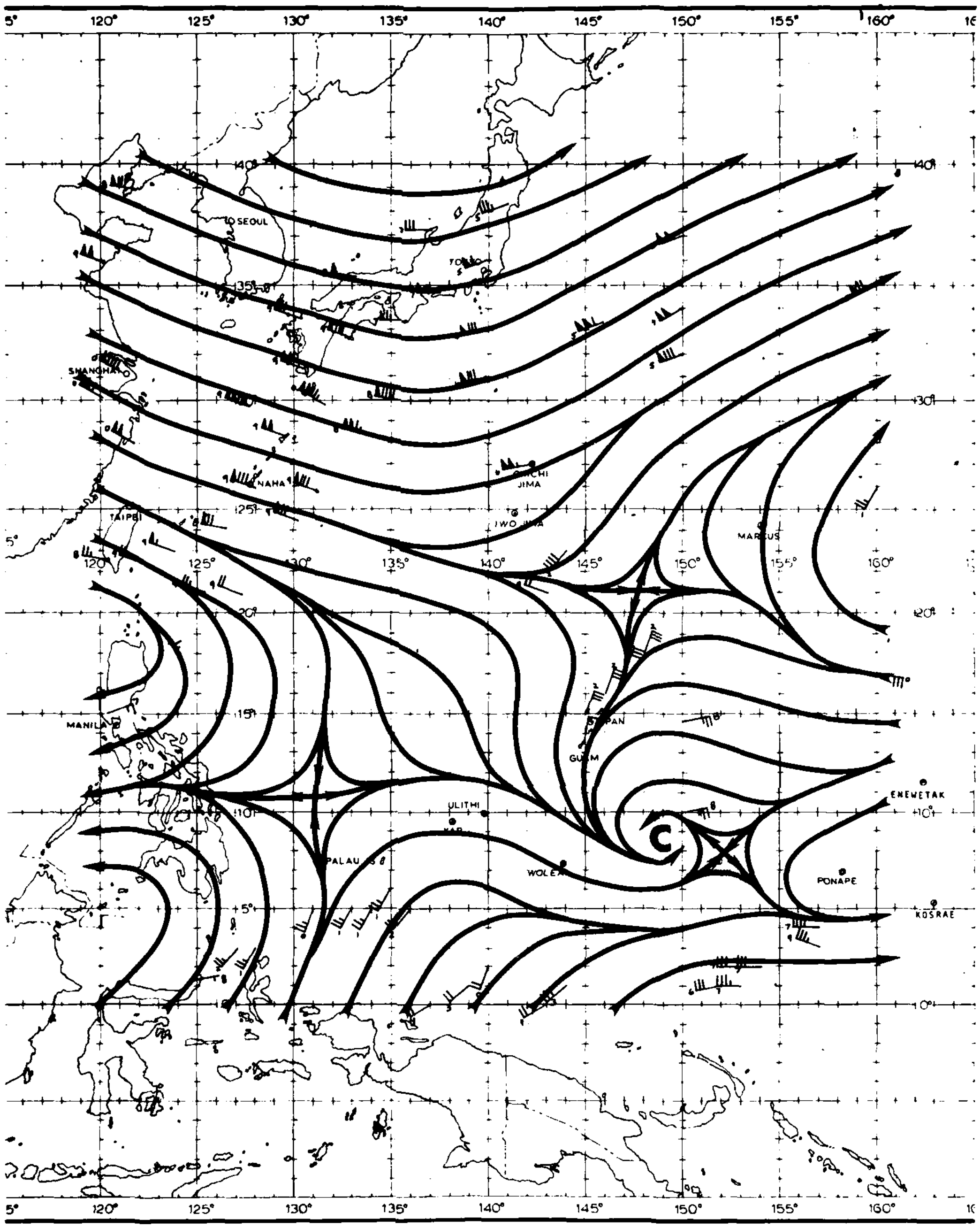
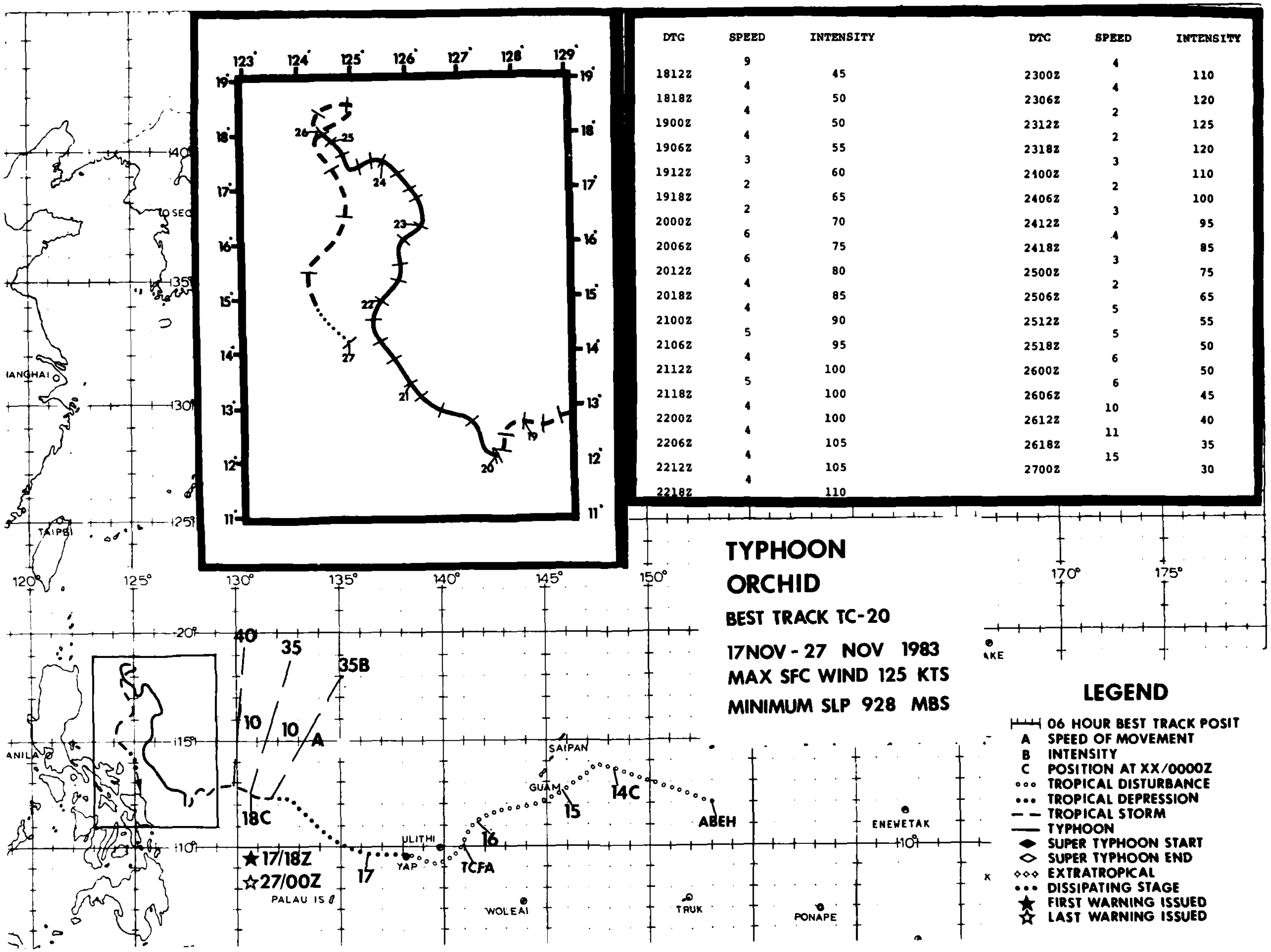


Figure 3-19-3. Norris formed in an area of light but highly divergent upper-level flow to the northeast of a TUTT cell (081200Z November 200 mb analysis).



DTG	SPEED	INTENSITY
1812Z	9	45
1818Z	4	50
1900Z	4	50
1906Z	4	55
1912Z	3	60
1918Z	2	65
2000Z	2	70
2006Z	6	75
2012Z	6	80
2018Z	4	85
2100Z	4	90
2106Z	5	95
2112Z	4	100
2118Z	5	100
2200Z	4	100
2206Z	4	105
2212Z	4	105
2218Z	4	110

DTG	SPEED	INTENSITY
2300Z	4	110
2306Z	4	120
2312Z	2	125
2318Z	2	120
2400Z	3	110
2406Z	2	100
2412Z	3	95
2418Z	4	85
2500Z	3	75
2506Z	2	65
2512Z	5	55
2518Z	5	50
2600Z	6	50
2606Z	6	45
2612Z	10	40
2618Z	11	35
2700Z	15	30

TYPHOON ORCHID (20W)

Typhoon Orchid was the first of three tropical cyclones to develop in the western North Pacific during mid-November. This flurry of activity in the northern hemisphere was accompanied by the development of two tropical cyclones in the southern hemisphere, Tropical Cyclone 04S and Tropical Cyclone 05S (Quenton). The establishment of strong low-level westerlies at low latitudes on both sides of the equator preceded the onset of activity.

Orchid developed from a tropical disturbance which was first detected on the 12th of November as an area of convective activity located 300 nm (556 km) north of Truk (WMO 91334). The disturbance moved southwestward over the next three days as its convection increased in intensity and size. The first aircraft reconnaissance mission to investigate the disturbance was conducted on 15 November while the disturbance was located 170 nm (315 km) southwest of Guam (WMO 91212). This mission did not succeed in closing off a circulation and indicated that the disturbance was a broad area of low pressure (MSLP of 1004 mb) with maximum sustained surface winds of 25 kt (13 m/s). Later satellite imagery indicated that the disturbance was becoming better organized. An increase in convective activity, accompanied by the development of an upper-level anticyclone led to the issuance of a TCFA at 0300Z on the 16th. A second aircraft reconnaissance mission, on the 17th, was also not able to close off a circulation and provided data indicating that there was little change in intensity from the previous mission. This information did not correlate with observations from satellite imagery which continued to show a marked increase in the organization of the system. Post-analysis revealed that the aircraft was investigating features not associated with the dominant circulation to the northwest. The first warning on Orchid as a tropical storm was issued at 1800Z on the 17th when intensity estimation by satellite indicated that maximum sustained winds were in the 40-45 kt (21-23 m/s) range.

Orchid's movement from this point on was highly erratic. Strong low-level northeasterlies were opposed at higher levels by southwesterly flow which resulted in a continual conflict in steering. This complex environment was further complicated by the development of Typhoon Percy in the South China Sea (Figure 3-20-1). The separation distance between Orchid and Percy remained constant at 850 nm (1574 km) throughout the period of their coexistence. Although there was not a Fujiwhara interaction observed in this case, the possibility of interaction was under constant consideration by JTWC forecasters.

In spite of the effects of vertical shear experienced by Orchid and Percy, both systems achieved typhoon intensity. Orchid's maximum intensity of 125 kt (64 m/s) was accompanied by an MSLP of 928 mb measured by aircraft on the 23rd. However, both systems eventually succumbed to the effects of vertical shear. Two days after reaching maximum intensity, Orchid had weakened significantly. Although maximum sustained winds were 55 kt (28 m/s), MSLP was up to 995 mb. Winds associated with Orchid were higher than might be expected for a circulation with such a high central pressure because ambient low-level flow was particularly strong. Gale force northeasterlies on the northwest side of Orchid's circulation augmented the winds on that side, resulting in a band of high winds which were much stronger than the winds on the southeast side of the circulation.

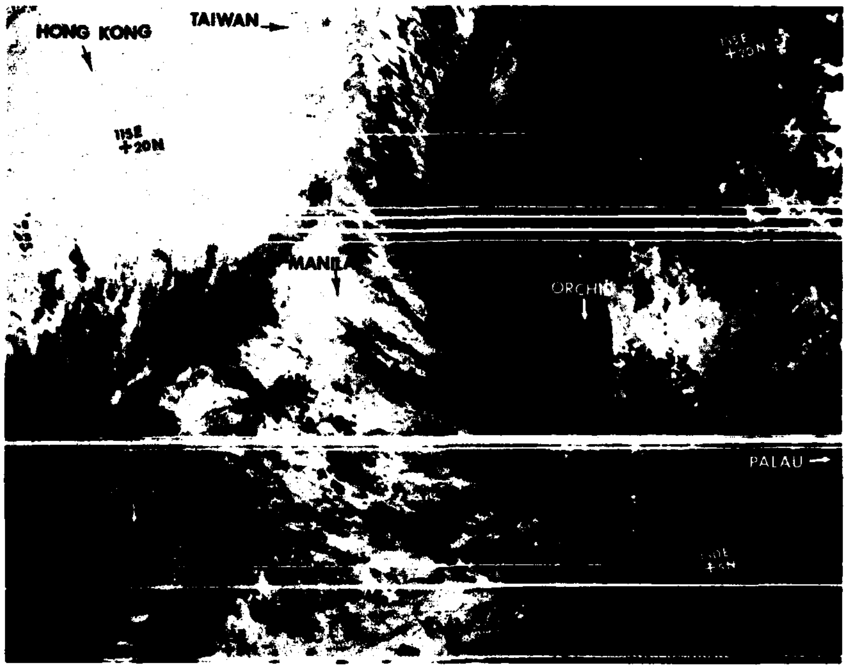
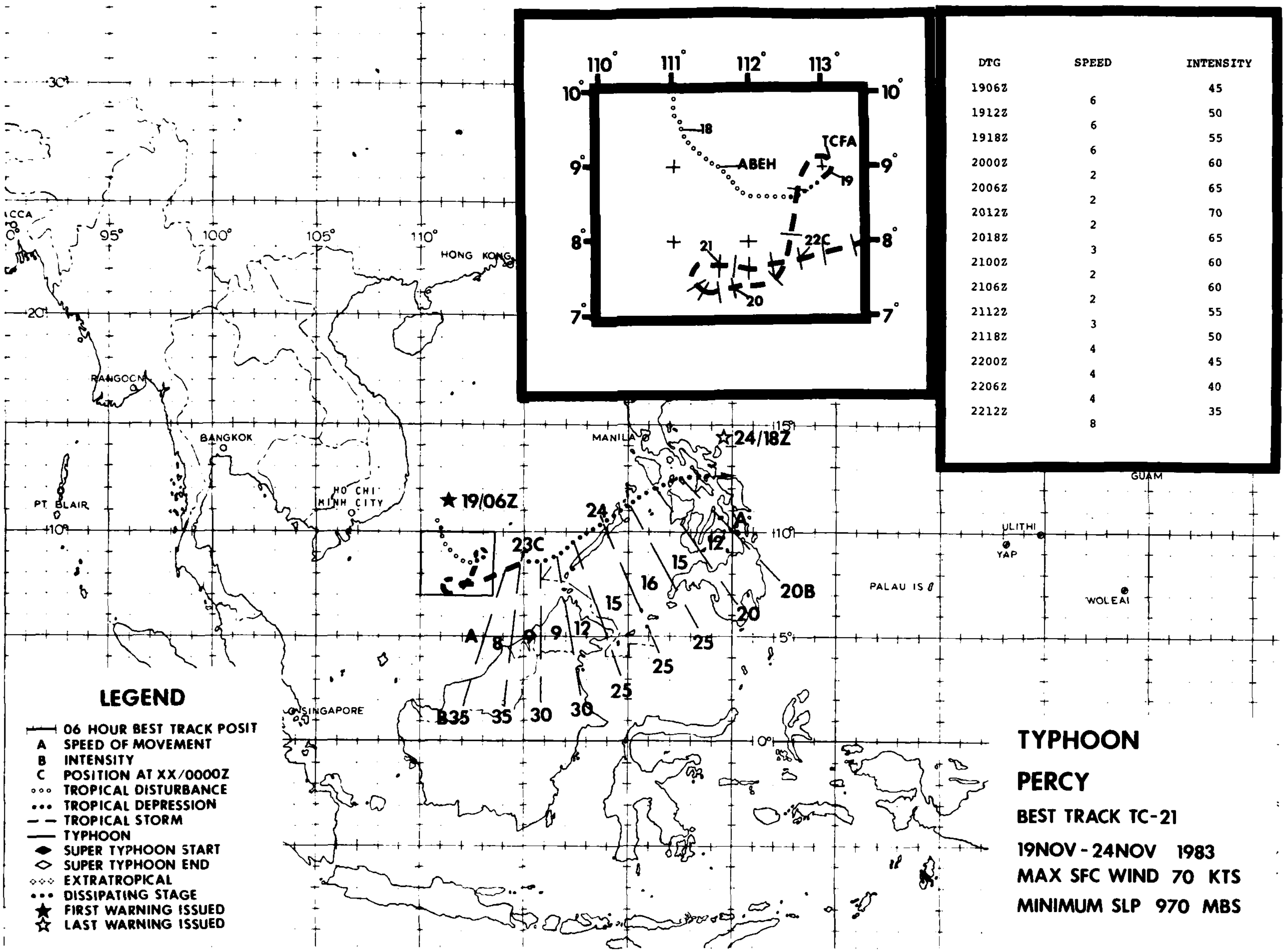


Figure 3-20-1. Orchid as a tropical storm (right) and the disturbance which developed into Typhoon Percy (left) (182336Z November NOAA 8 infrared imagery).

As Orchid weakened, the influence of low-level steering became greater and the circulation moved southward. By the time of the final warning, Orchid was located 40 nm (74 km) west of the position it had occupied five and a half days earlier.

Although Orchid posed a threat to the Philippine Islands for several days, landfall was not made on any of the islands. However, high winds and seas associated with Orchid posed a hazard to maritime interests at great distances from the center. An inter-island ferry, MV Dona Cassandra (487 tons) capsized and sank in the Suriago Strait during a transit between Butuan, Mindanao and Cebu. Of the 387 passengers and crew onboard, 167 were killed.

In addition to the loss of the Dona Cassandra, Orchid was responsible for damages to the SS Mallory Lykes. Mallory Lykes was headed west across the Philippine Sea when she passed close to Orchid's center. The 60 kt (31 m/s) winds and 24 ft (7 m) seas encountered by the ship caused two engines carried as cargo to break free of their lashings. These eight ton engines caused considerable damage to hull frames and plating as they clattered about but fortunately did not injure any personnel.



DTG	SPEED	INTENSITY
1906Z	6	45
1912Z	6	50
1918Z	6	55
2000Z	2	60
2006Z	2	65
2012Z	2	70
2018Z	3	65
2100Z	2	60
2106Z	2	60
2112Z	3	55
2118Z	4	50
2200Z	4	45
2206Z	4	40
2212Z	8	35

From genesis to dissipation, every aspect of Percy's life was affected in some manner by its proximity to Typhoon Orchid (20W). As Orchid neared the Philippines on 17 November, an area of upper-level divergence was created over the South China Sea where Orchid's outflow split into southerly and easterly components. Beneath this upper-level divergence, the confluence of the northeasterly monsoon and the southwesterly inflow into Orchid created an area of high positive vorticity. Typhoon Percy formed in this fertile environment.

A tropical disturbance quickly formed but showed no signs of further development until 1600Z on the 18th. In the eight hour period between 181600Z and 190000Z, the disturbance intensified rapidly, forming convective bands and an upper-level anticyclone. A TCFA was issued at this time and was followed rapidly by a warning when continued intensification became apparent from satellite imagery (Figure 3-21-1). A reconnaissance aircraft investigated the area shortly after issuance of the first warning and found a well-developed tropical storm with a circular eye and maximum sustained winds of 50 kt (26 m/s).

Percy moved very erratically for the first four days in warning status. After completing a series of loops and feints, Percy's position at 230600Z was only 90 nm (170 km) from its position at 190600Z. The proximity of Orchid to the northeast of Percy and the complicated steering environment in which both systems were embedded made forecasting especially difficult. The possibilities were endless; Fujiwhara interactions or the entrainment of one system into the other were two of the scenarios considered at the time by JTWC forecasters.

Percy eventually sheared and became embedded in Orchid's inflow, but not before achieving typhoon status and a maximum intensity of 70 kt (36 m/s). The reports of reconnaissance aircraft throughout Percy's life best tell the story. On 19 November, the first aircraft encountered a well-developed tropical storm with 50 kt (26 m/s) winds and a circular eye. The next mission at 200905Z encountered a 70 kt (36 m/s) typhoon with an MSLP of 971 mb. By 202344Z, Percy was beginning to shear and the aircraft reported a ragged elliptical eye with a poor radar presentation. The 210950Z reconnaissance flight reported that Percy no longer had an eye and that all clouds were below the 700 mb flight level. By the time of the 230241Z mission, Percy was an exposed low-level circulation with maximum sustained winds of 35 kt (18 m/s). The final aircraft reconnaissance mission, at 240200Z, was unable to fix Percy. The final warning on Percy was issued at 241800Z when it became impossible to identify the circulation.

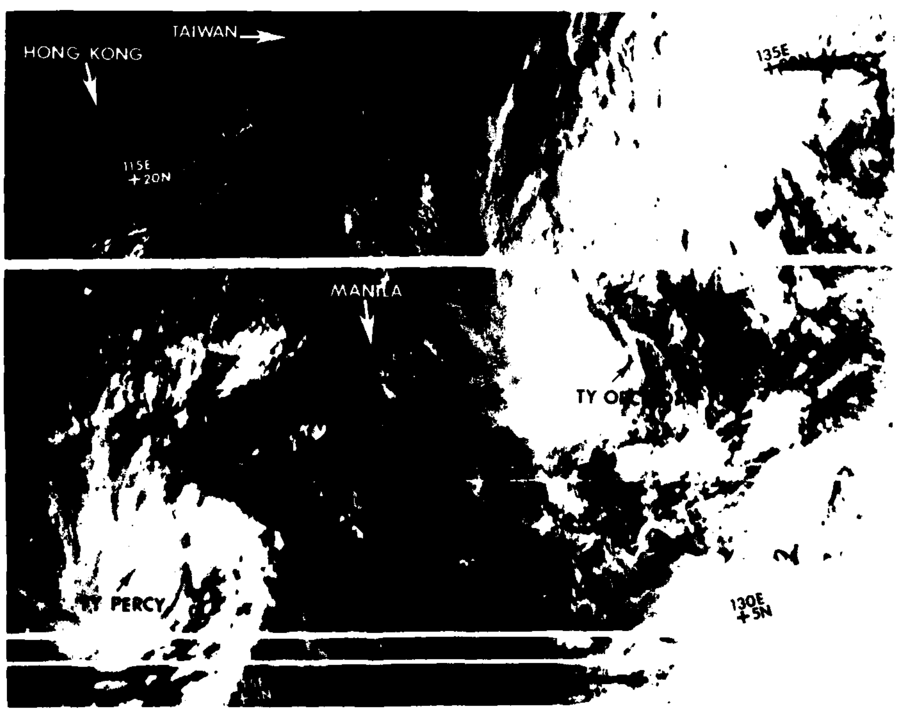
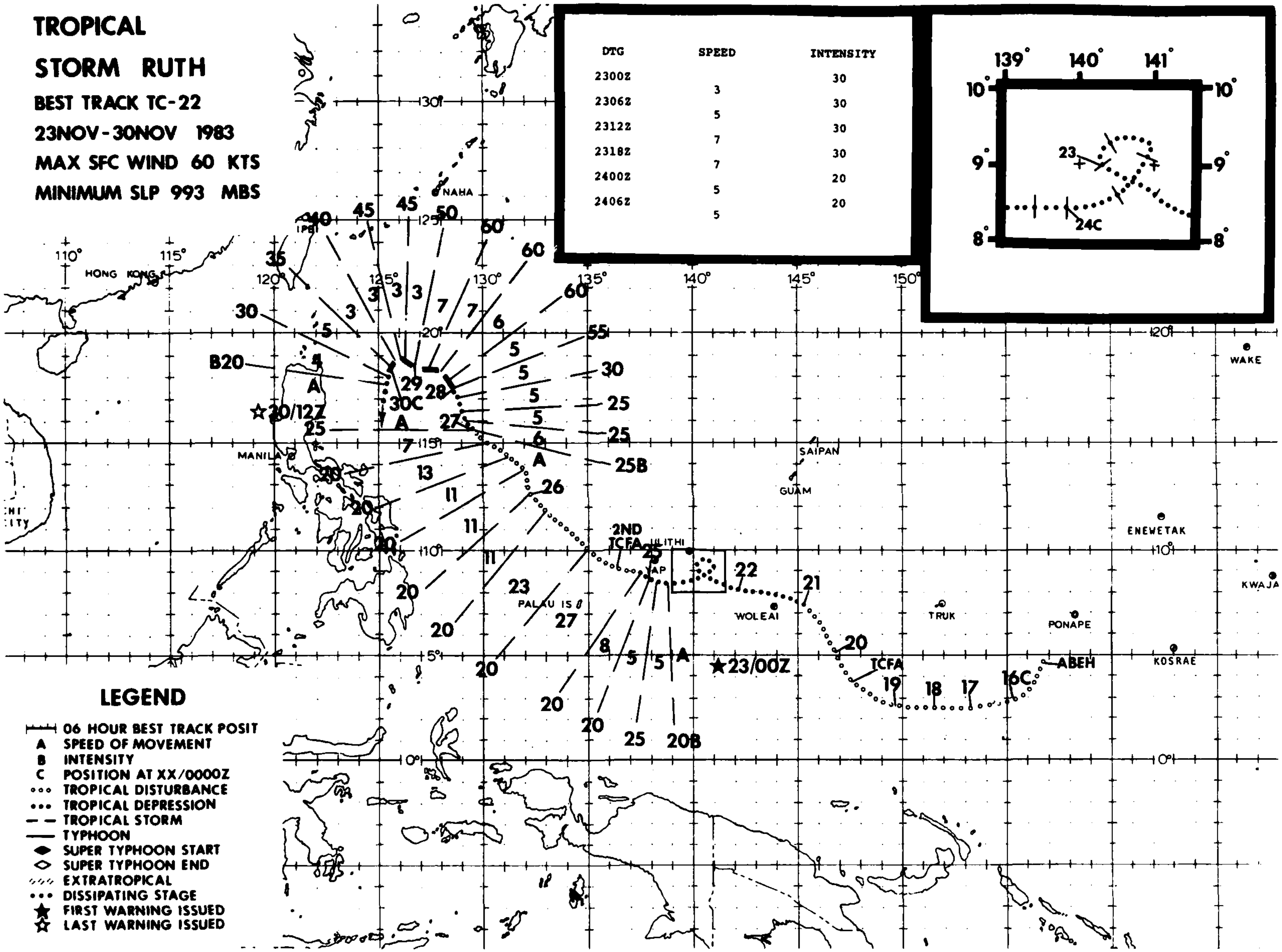


Figure 3-21-1. Percy (left) and Orchid (right), both at tropical storm intensity (182336Z November NOAA 8 visual imagery).

TROPICAL STORM RUTH

BEST TRACK TC-22
23NOV-30NOV 1983
MAX SFC WIND 60 KTS
MINIMUM SLP 993 MBS

DTG	SPEED	INTENSITY
2300Z		30
	3	
2306Z		30
	5	
2312Z		30
	7	
2318Z		30
	7	
2400Z		20
	5	
2406Z		20
	5	



LEGEND

- 06 HOUR BEST TRACK POSIT
- A SPEED OF MOVEMENT
- B INTENSITY
- C POSITION AT XX/0000Z
- ∘∘∘ TROPICAL DISTURBANCE
- ••• TROPICAL DEPRESSION
- — — TROPICAL STORM
- —— TYPHOON
- ◆ SUPER TYPHOON START
- ◇ SUPER TYPHOON END
- ⁄⁄⁄ EXTRATROPICAL
- ••• DISSIPATING STAGE
- ★ FIRST WARNING ISSUED
- ☆ LAST WARNING ISSUED

TROPICAL STORM RUTH (22W)

Ruth was one of the more erratic storms of 1983. It dissipated, regenerated, looped, moved at speeds varying from 3 to 25 kt (6-46 km/hr), and was the subject of four TCFA's and two final warnings.

Ruth was first detected as a tropical disturbance embedded in the near-equatorial trough southeast of Guam. The disturbance was discussed in the Significant Tropical Weather Advisory (ABEH PGTW) on 15 November and was monitored closely for the next four days as it moved westward along the trough axis. Little change in organization or intensity was observed during this period. MSLP was fairly constant at 1008 mb and surface winds in the area were 5-10 kt (3-5 m/s).

On the 19th of November, the disturbance showed signs of development. Associated convective activity expanded to cover a large area approximately 1200 nm (2222 km) east and west by 900 nm (1667 km) north and south. Convection was intense and weakly banded into a center near 5N 147E. A TCFA was issued for the disturbance at 191600Z when surface winds picked up to 15-25 kt (8-13 m/s).

The disturbance was continued in alert status for four days as it moved slowly northwestward without any further development. Aircraft reconnaissance flights into the area on the 20th and 21st were unable to close off a surface center and provided data indicating the presence of a surface trough or circulation of synoptic scale. Ruth's arrested development at this stage was due to the presence of Orchid to the west and the passage of a frontal system to the northwest. Although inflow on the north side of Ruth was provided in abundance by the Trade Winds, inflow on the south side was very weak. Most of the low latitude westerly flow was drawn into Orchid leaving an area of weak westerlies to the east of Orchid flowing into Ruth. The frontal system to the northwest of Ruth interacted with the subtropical ridge to create an area of enhanced mid-level flow inhibiting the development of a circulation at the mid-levels.

In spite of these factors, Ruth was able to maintain convective organization and even intensified slightly with maximum sustained winds reaching 30 kt (15 m/s). A reconnaissance aircraft on an investigative mission at 222345Z was able to close off a surface circulation with MSLP of 1004 mb. The first warning on Ruth as a tropical depression was issued on receipt of this report and projected continued slow intensification and north-northwestward movement.

Ruth maintained 30 kt (15 m/s) intensity for the next 24 hours as it completed an anticyclonic loop but appeared on satellite imagery to be shearing in the process. Warnings were terminated at 240000Z after data from reconnaissance aircraft indicated that maximum sustained winds associated with the circulation were 20 kt (10 m/s).

Over the next four days, Ruth moved quite erratically while exhibiting wide ranging fluctuations in its convective signature on satellite imagery. A TCFA was issued at 250820Z when reconnaissance aircraft located a broad circulation with maximum surface winds of 25 kt (13 m/s) and MSLP of 1004 mb. Ruth remained in alert status until satellite imagery on the 26th indicated that the circulation was shearing. Ruth was placed in alert status again at 270343Z when it appeared from satellite imagery that the circulation was regaining vertical alignment. Synoptic conditions at this time were favorable for further development. Typhoon Orchid had weakened to a tropical depression and no longer competed with Ruth for inflow. At the same time, the destructive interaction between Ruth and the frontal system previously discussed was broken as the front propagated eastward.

Ruth flourished in this environment and intensified rapidly. A reconnaissance aircraft reported surface winds of 55 kt

(28 m/s) and MSLP of 997 mb at 272340Z just prior to the resumption of warnings on Ruth at 280000Z. Maximum winds associated with Ruth were higher than would be expected from the MSLP due to the enhancement of Ruth's circulation by an intense north-easterly monsoon gale area on its northwest side.

Ruth peaked at a maximum intensity of 60 kt (31 m/s) briefly on the 28th before the shearing effects of its environment caused it to weaken for the final time. Ruth was able to intensify to near typhoon intensity in spite of its location in an area of moderate vertical shear. However, when the northeasterly monsoon flow was enhanced further by a cold outbreak from the continent, the resultant increase in vertical shear proved to be too much for the plucky little system. Ruth weakened rapidly after shearing and dissipated as an exposed low-level circulation on the 30th.

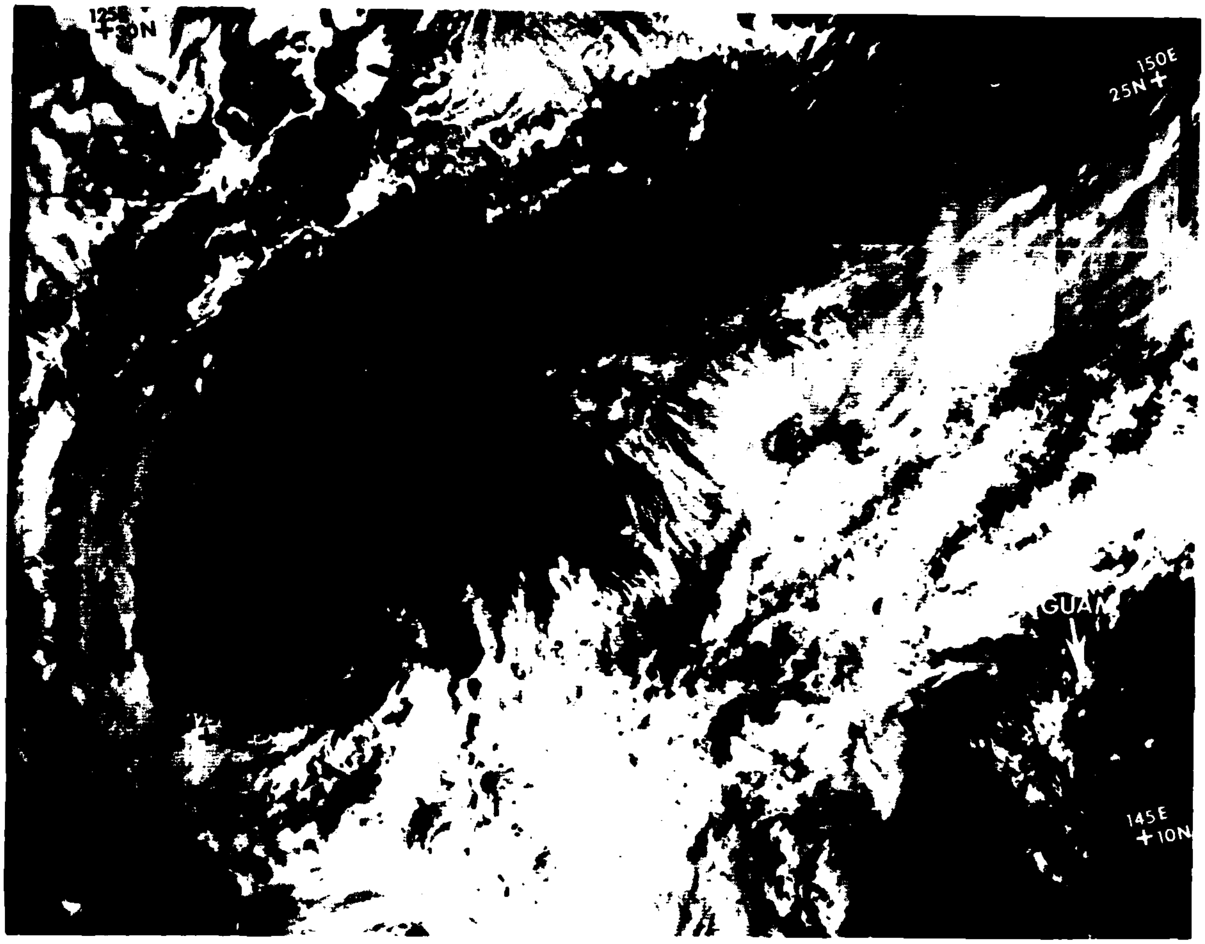
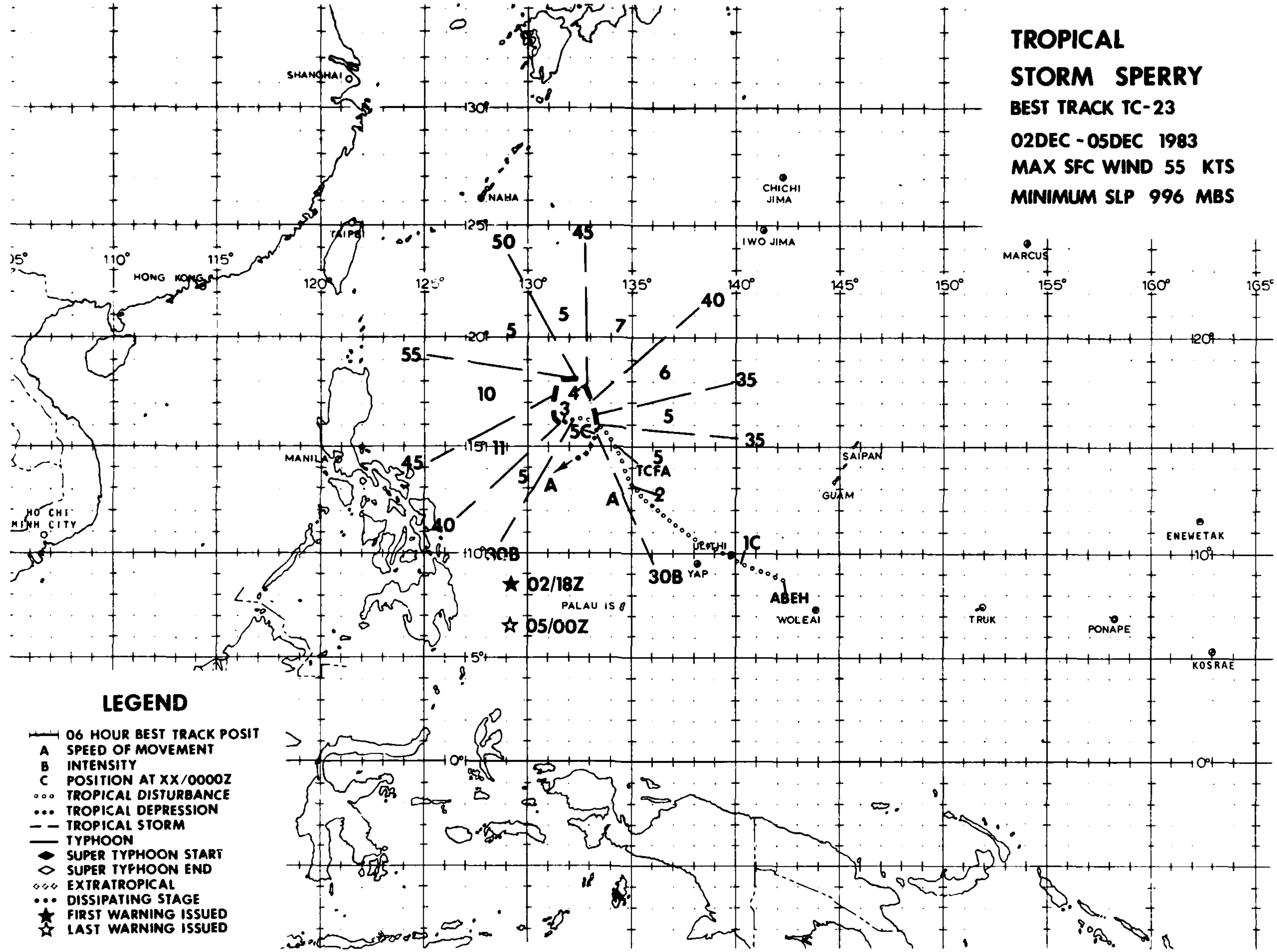


Figure 3-22-1. Tropical Storm Ruth near maximum intensity. Interaction with the frontal boundary to the north and the cold air outbreak south of Japan led to Ruth's destruction two days later (280935Z November DMSP infrared imagery).


TROPICAL
STORM SPERRY
BEST TRACK TC-23
02DEC - 05DEC 1983
MAX SFC WIND 55 KTS
MINIMUM SLP 996 MBS
SHANGHAI
HONG KONG
TAIPEI
NAHA
MANILA
HO CHI MINH CITY
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
YAP
ULITHI
WOLEAI
PALAU IS
TRUK
PONAPE
ENEWETAK
KOSRAE
TCFA
★ 02/18Z
☆ 05/00Z
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED

AD-A137 836 ANNUAL TROPICAL CYCLONE REPORT 1983(U) NAVAL OCEANOGRAPHY COMMAND CENTER/JOINT TYPHOON WARNING CENTER FPO SAN FRANCISCO 96630 B L HOLT ET AL. 1983

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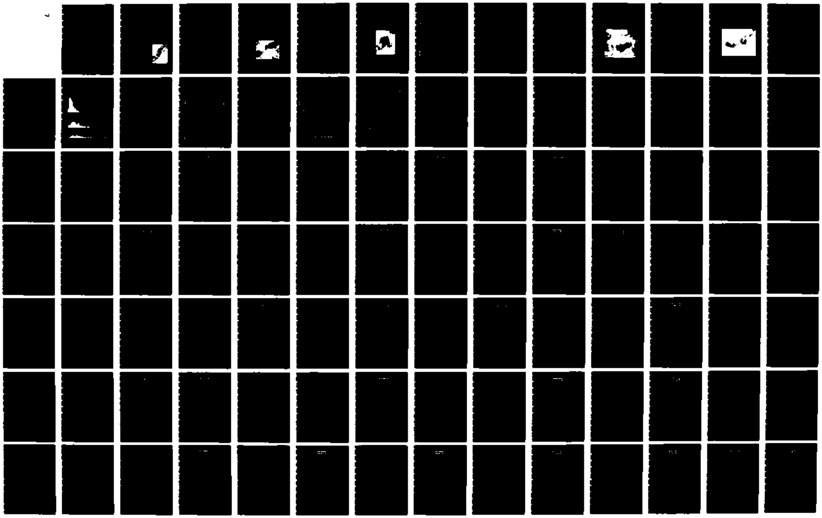
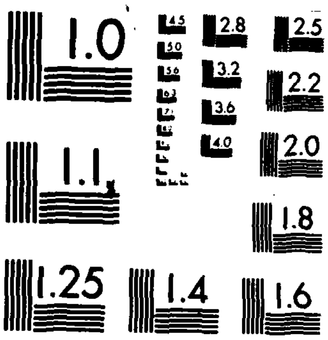




MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

The disturbance which became the 23rd tropical cyclone of the year originated in an elongated band of unorganized convection associated with a near-equatorial trough. This cyclone, eventually called Sperry, was to be a short-lived system, lasting about two and one-half days before dissipating in a manner similar to that of two of its predecessors - Typhoon Orchid and Tropical Storm Ruth.

As the remnants of Tropical Storm Ruth faded away, the monsoon trough became active again and reestablished itself, stretching from the south Philippine Sea eastward to the Marshall Islands. The convective activity covered a broad area between 4-10N and 130-150 E. On the 30th of November, a surface circulation embedded in the trough about 400 nm (740 km) south of Guam appeared to be gaining in organization and intensity. MSLP at this time was 1009 mb and associated winds were 10 to 15 kt (5-8 m/s). Over the following 24 hours, MSLP in the circulation dropped to 1006 mb and convective activity increased significantly.

At this point, it appeared that the circulation was well organized and on its way to becoming a significant tropical cyclone with a few more days of development. However, between 010000Z and 011200Z December, the center of convective activity shifted to a point 500 nm (926 km) to the northwest. This radical shift was accompanied by the development of an upper-level anticyclone over the new location. Continued intensification of the center led to the issuance of a TCFA at 0300Z on the 2nd. Shortly after the issuance of this alert, a reconnaissance aircraft investigated the area and found an elongated surface trough with pressures around 1006 mb and winds of 15-30 kt (8-15 m/s).

The first warning on Sperry was issued at 021800Z when analysis of satellite imagery resulted in a Dvorak T-number of 2.5 or 35 kt (18 m/s). The accuracy of this analysis was confirmed a few hours later by reconnaissance aircraft. Data collected by reconnaissance aircraft indicated that Sperry exhibited considerable tilt. The surface center was displaced 30-60 nm (56-111 km) to the south of the 700 mb center. This was not unexpected since the circulation was located in an area of strong vertical shear. Figure 3-23-1 illustrates the steering influences acting on Sperry at the time. Tilting of the system prior to shearing away of the upper portion of the circulation is a common occurrence in this situation. Therefore, it came as a surprise when Sperry regained vertical alignment and intensified. Maximum intensity of 55 kt (28 m/s) was achieved as Sperry turned eastward at 031200Z. Figure 3-23-2 shows Sperry near maximum intensity.

The forecast at this point called for Sperry to complete an anticyclonic loop and dissipate over water as an exposed low-level circulation. This forecast was a radical departure from persistence. Over the previous 18 hours, Sperry had intensified from a tropical depression to an intense tropical storm. At the same time, Sperry's speed of motion doubled as it turned northward, then northeastward. Persistence in this case called for continued northeastward movement and intensification.

Sperry sheared as expected and moved southward while weakening over the next 36 hours. The final warning was issued at 050000Z when data from reconnaissance aircraft indicated that Sperry's MSLP had risen to 1010 mb and maximum sustained winds had dropped to 20 kt (10 m/s).

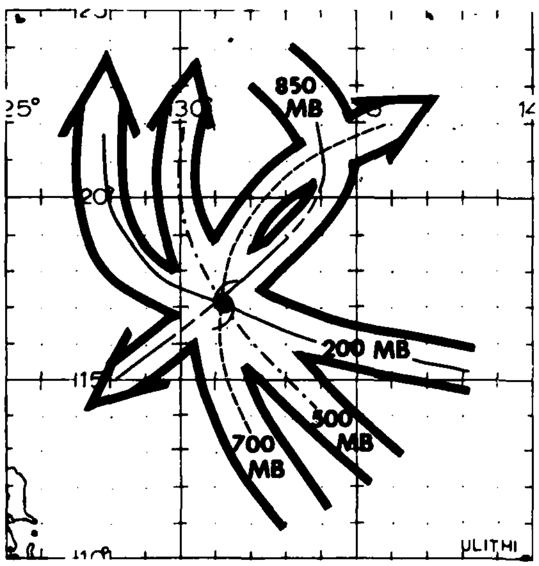
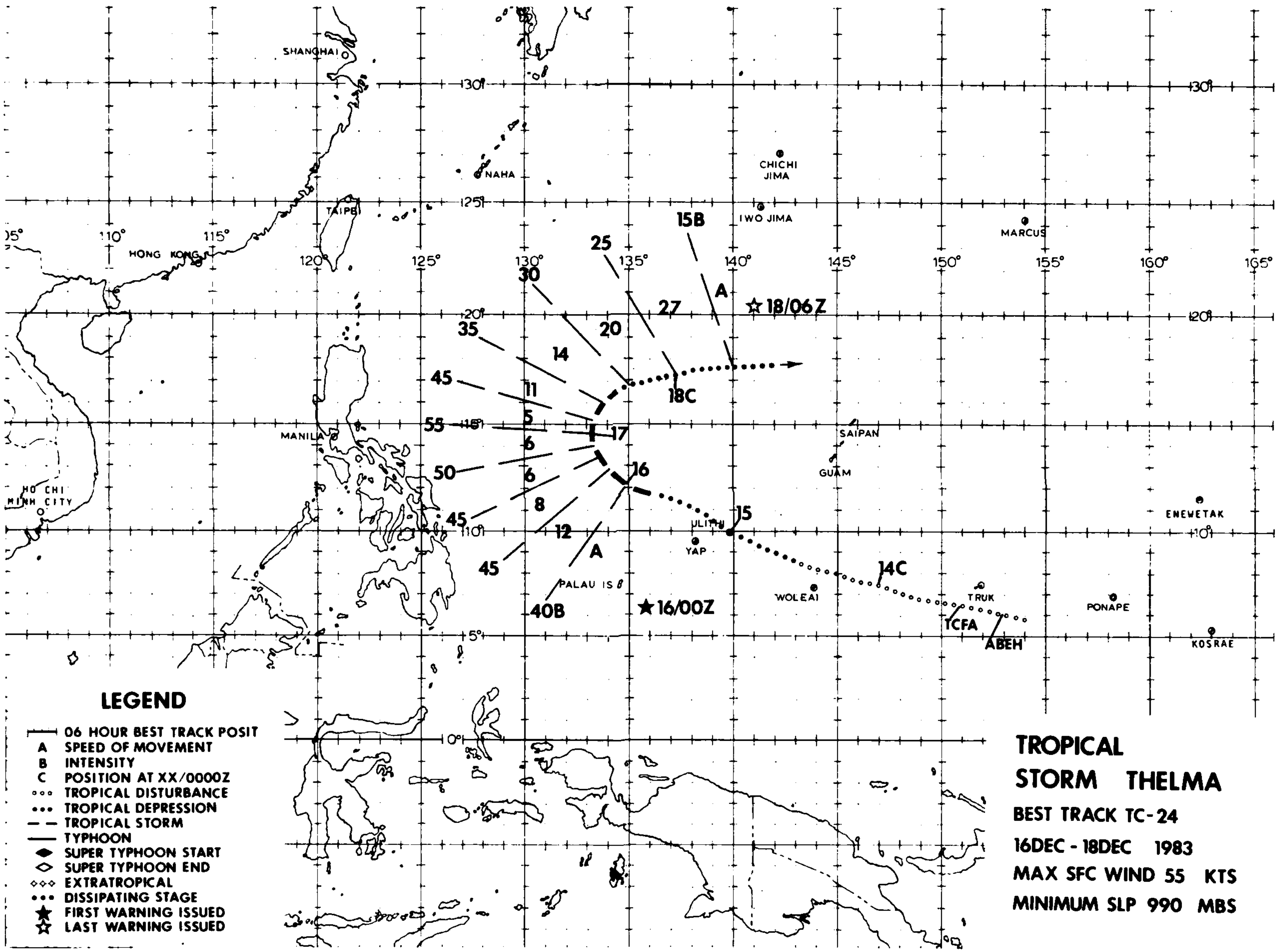


Figure 3-23-1. Diagram illustrating the direction of steering flow at various levels in the vicinity of Sperry.

Figure 3-23-2. Tropical Storm Sperry at maximum intensity while undergoing an anticyclonic loop (031335Z December DMSP infrared imagery).



TROPICAL STORM THELMA

BEST TRACK TC-24

16DEC - 18DEC 1983

MAX SFC WIND 55 KTS

MINIMUM SLP 990 MBS

Thelma, the final tropical cyclone of the 1983 season, formed to the east of the Caroline Islands during mid-December. It was the only late-season cyclone to recurve in the western Philippine Sea.

Thelma was initially detected on 11 December as a weak surface circulation embedded in the near-equatorial trough near 4N 170E. Upper-level flow in the area was highly divergent due to the presence of a TUTT cell to the north of the low-level trough. A broad area of convective activity existed below the divergent upper-level flow, and was not confined to the proximity of the low-level circulation.

Over the next two days, the TUTT cell moved westward into a position to the northwest of the low-level circulation. An anticyclone formed over the low-level circulation in the lee of the TUTT, prompting the issuance of a TCFA at 131200Z.

Thelma remained in alert status for two and one-half days while moving rapidly westward. Repeated investigative flights by reconnaissance aircraft during this period provided data indicating that the circulation remained poorly defined. Concurrently, Thelma's appearance on satellite imagery indicated that the system was becoming better organized with well-developed outflow.

The first warning on Thelma, as a tropical storm, was issued when reconnaissance aircraft located a tight circulation center at 160100Z. MSLP was 996 mb and maximum surface winds observed were 40 kt (21 m/s). The forecast called for Thelma to continue moving west-northwestward for the first 24 hours, then shear and assume a westward track as an exposed low-level circulation. Three previous storms (Orchid, Ruth, and Sperry) had reacted in a like manner under similar circumstances. These storms had reacted to the passage of a mid-latitude frontal system by shearing under the pressure of enhanced but opposing flows at lower and middle-levels. As the frontal system approached to the northwest of Thelma, a repeat of these performances was expected.

Thelma's classic recurvature in advance of the front proved the fallacity of JTWC's forecast reasoning. Thelma's environment differed from its predecessors' in that it was not embedded in strong northeasterly flow at the low-levels. Although the northeasterly monsoon was well established in close proximity to the Asian Continent, Thelma was beyond its influence in the central Philippine Sea.

Thelma achieved maximum intensity of 55 kt (28 m/s) just prior to recurving on the 17th. After recurvature, Thelma dissipated rapidly under the effects of intense vertical shear (Figure 3-24-1). The strength of the upper-level flow impacting Thelma is reflected in the rapidity with which the system sheared while moving northeastward at speeds up to 27 kt (50 km/hr).

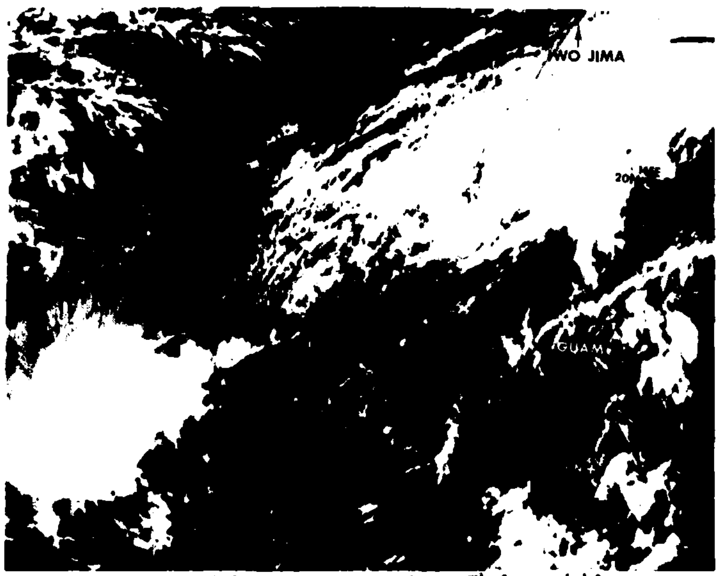
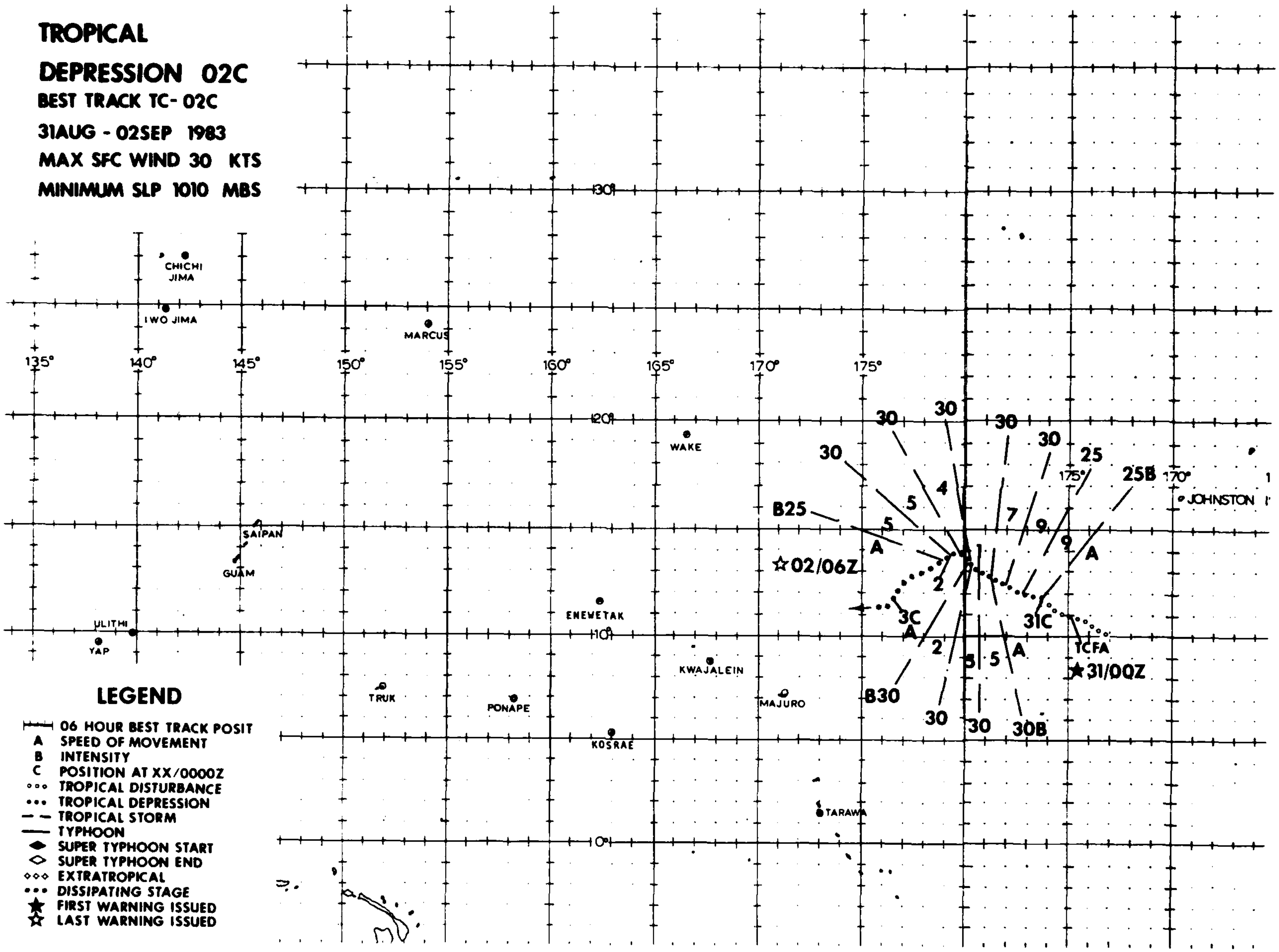


Figure 3-24-1. After recurvature, Thelma quickly dissipated and became absorbed into the frontal system. Only 24 hours after maximum intensity, the remains of Thelma were no longer distinguishable from the frontal system (upper right). The cloud feature at lower left is not associated with Thelma but is a "blow-up" frequently observed at the trailing edge of a front in the western North Pacific (180056Z December DMSP visual imagery).

TROPICAL DEPRESSION 02C

BEST TRACK TC-02C
31AUG - 02SEP 1983
MAX SFC WIND 30 KTS
MINIMUM SLP 1010 MBS



TROPICAL DEPRESSION 02C

During late August, two tropical disturbances developed in the central North Pacific Ocean, east of the International Dateline, and tracked westward into the JTWC area of responsibility. The first of these disturbances crossed the dateline on 27 August and later became Typhoon Ellen (10W). As this disturbance moved westward toward Enewetak Atoll (WMO 91250), a second disturbance began to develop southwest of Johnston Island (WMO 91275). At 301530Z, the Naval Western Oceanography Center, Pearl Harbor, Hawaii, issued a TCFA for this disturbance, which was followed by the initial warning at 310600Z from the Central Pacific Hurricane Center (CPHC), Honolulu, Hawaii.

During the first 24 hours in warning status, Tropical Depression 02C moved toward the northwest and the dateline. At 312345Z August, satellite fix information from the National Environmental Satellite, Data and Information Service (NESDIS) office in Honolulu, Hawaii, indicated that Tropical Depression 02C had reached the dateline (see Figure 3-25-1). Based on this information, the CPHC issued their final warning for 010000Z September position and transferred warning responsibility to the JTWC.

After 010000Z, satellite fix positions began to oscillate east and west of the dateline. It seems likely that Tropical Depression 02C may have slowed, or moved erratically, near the dateline before resuming a westward track on 2 September. During this period, a break in the subtropical ridge was present northwest of Tropical Depression 02C. Tropical Depression 02C was forecast to respond to this break by moving slowly northwestward. However, that response was never realized, and once the subtropical ridge strengthened, Tropical Depression 02C moved west-southwestward and eventually dissipated over open water.

Figure 3-25-1. Tropical Depression 02C at its peak intensity. This imagery provided information to both the CPHC and JTWC that Tropical Depression 02C had reached the dateline. However, it was 24 hours later that satellite fix data indicated a significant movement westward from the dateline (312345Z August GOES-West visual imagery, courtesy of the National Environmental Satellite, Data and Information Service, Honolulu, Hawaii).

2. NORTH INDIAN OCEAN TROPICAL CYCLONES

Tropical cyclone activity in the North Indian Ocean was below normal during 1983. Only three storms originated in this area as compared to the annual average of 4.6. A fourth system, Tropical Storm Kim, moved into the area from the western North Pacific. (See Tropical Storm Kim (16W)). Tables 3-6 and 3-7 provide a summary of North Indian Ocean tropical cyclone activity.

TABLE 3-6. NORTH INDIAN OCEAN

1983 SIGNIFICANT TROPICAL CYCLONES

TROPICAL CYCLONE	PERIOD OF WARNING	CALENDAR DAYS OF WARNING	NUMBER OF WARNINGS ISSUED	MAXIMUM SURFACE WIND (KT)	ESTIMATED MSLP (MB)	BEST TRACK DISTANCE TRAVELED (NM)
1. TC 01A	10 AUGUST	1	3	45	985	461
2. TC 02B	3 OCT - 4 OCT	2	5	50	990	370
3. TC 03B	7 NOV - 9 NOV	3	10	55	980	900
	1983 TOTALS:	6	18			

TABLE 3-7.

1983 SIGNIFICANT TROPICAL CYCLONES

NORTH INDIAN OCEAN	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
ALL TROPICAL CYCLONES	-	-	-	-	-	-	-	1	-	1	1	-	3
1975-1982													
AVERAGE	.1	-	-	.1	.8	.5	-	-	.4	1.0	1.4	.4	4.6
CASES	1	-	-	1	6	4	-	-	3	8	11	3	37

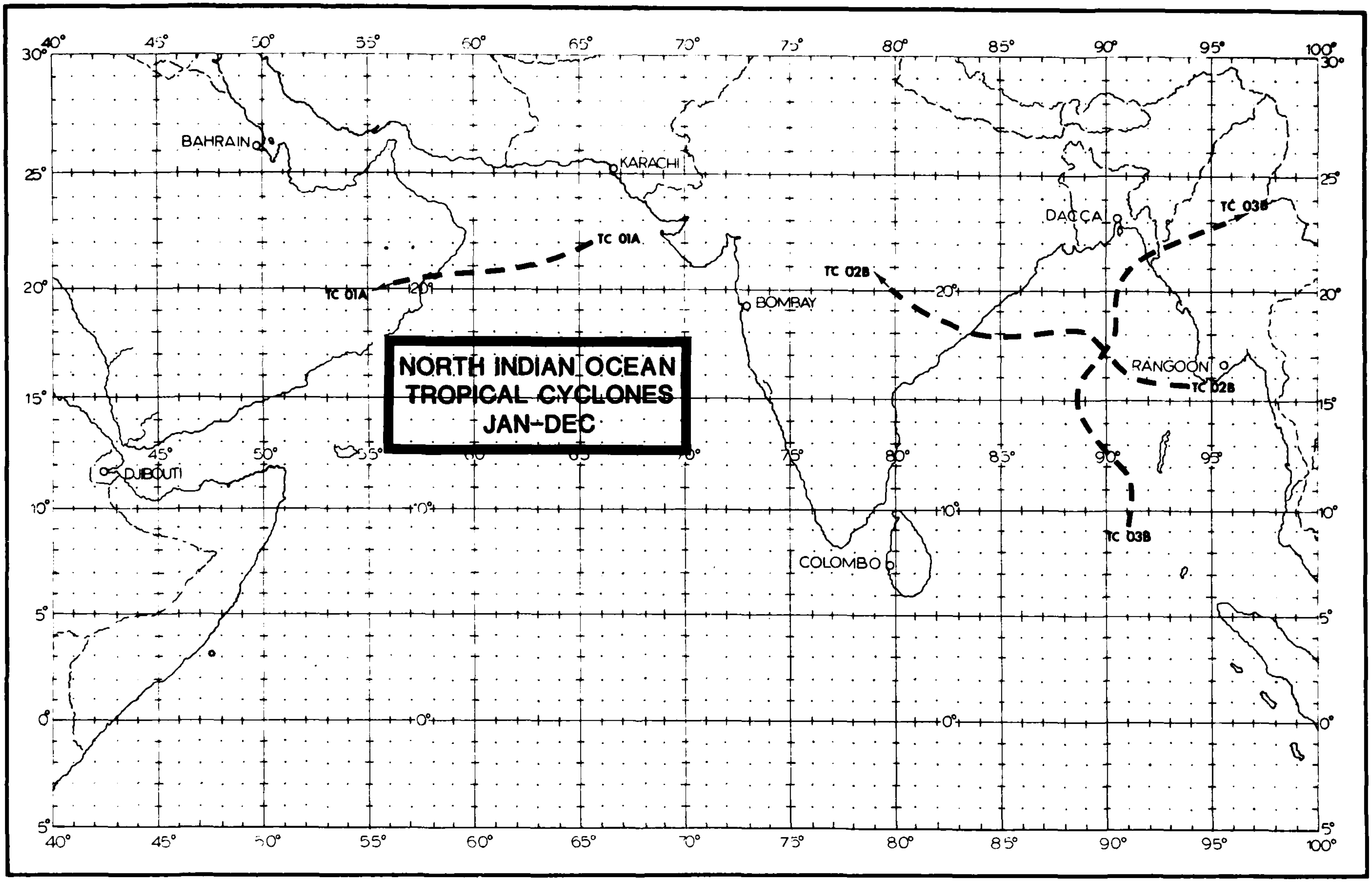
FORMATION ALERTS: Two out of three systems on which Formation Alerts were issued developed into significant tropical cyclones.

WARNINGS:

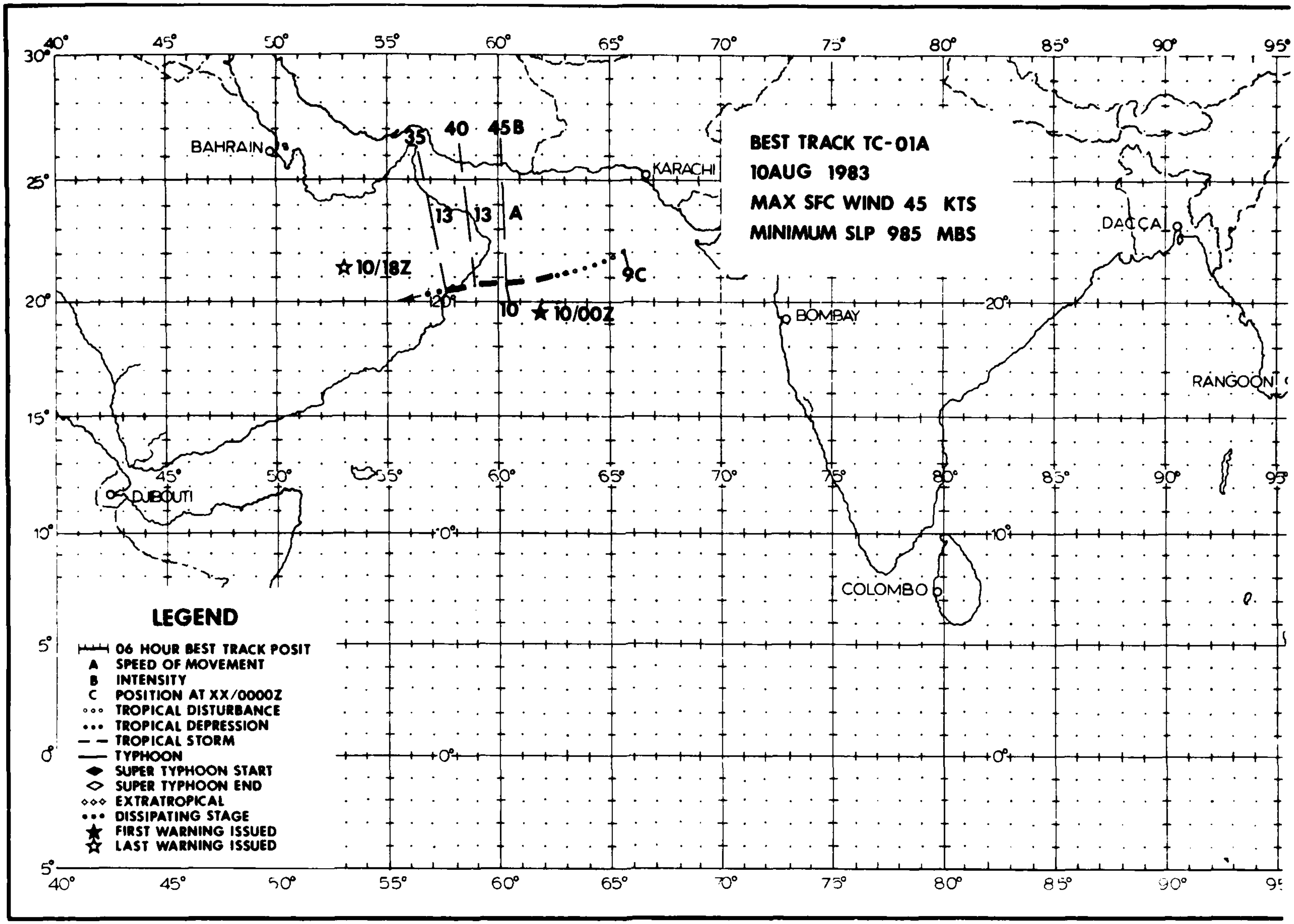
Number of warning days: 6

Number of warnings days with two tropical cyclones in region: 0

Number of warning days with three or more tropical cyclones in region: 0



FWC/JTWC GUAM 3142/62 (NEW 2-76)



FWC/JTWC GUAM 3142/62 (NEW 2-76)

TROPICAL CYCLONE 01A (AURORA)

Aurora was first detected on 8 August using satellite imagery. It appeared as a loosely organized area of convective activity in the northern Arabian Sea. Synoptic data was sparse in the area and was not useful for intensity estimation. Dvorak intensity estimates indicated that maximum sustained surface winds in the area were approximately 25 kt (13 m/s). This convective area was monitored by satellite for the next 24 hours and continued to appear loosely organized as it moved westward across the Arabian Sea.

On the 9th of August, the system became better organized and appeared to have formed a coherent surface circulation (Figure 3-26-1). Dvorak intensity estimates continued to reflect tropical depression strength and synoptic data at the time gave no indication of the presence of a surface circulation in the area.

The initial warning was issued at 100000Z after shipboard surface observations indicated the presence of 40 kt (21 m/s) northeasterly winds near Aurora. At the time, Aurora was approximately 90 nm (167 km) east of the coast of Oman with evidence of a strong 35 to 45 kt (18 to 23 m/s) southwesterly monsoon gale area extending to near its latitude. Aurora moved rapidly onshore during the subsequent 12-hour period and dissipated. The final warning was issued at 101800Z, just 18 hours after attaining warning status and less than 42 hours after its initial detection.

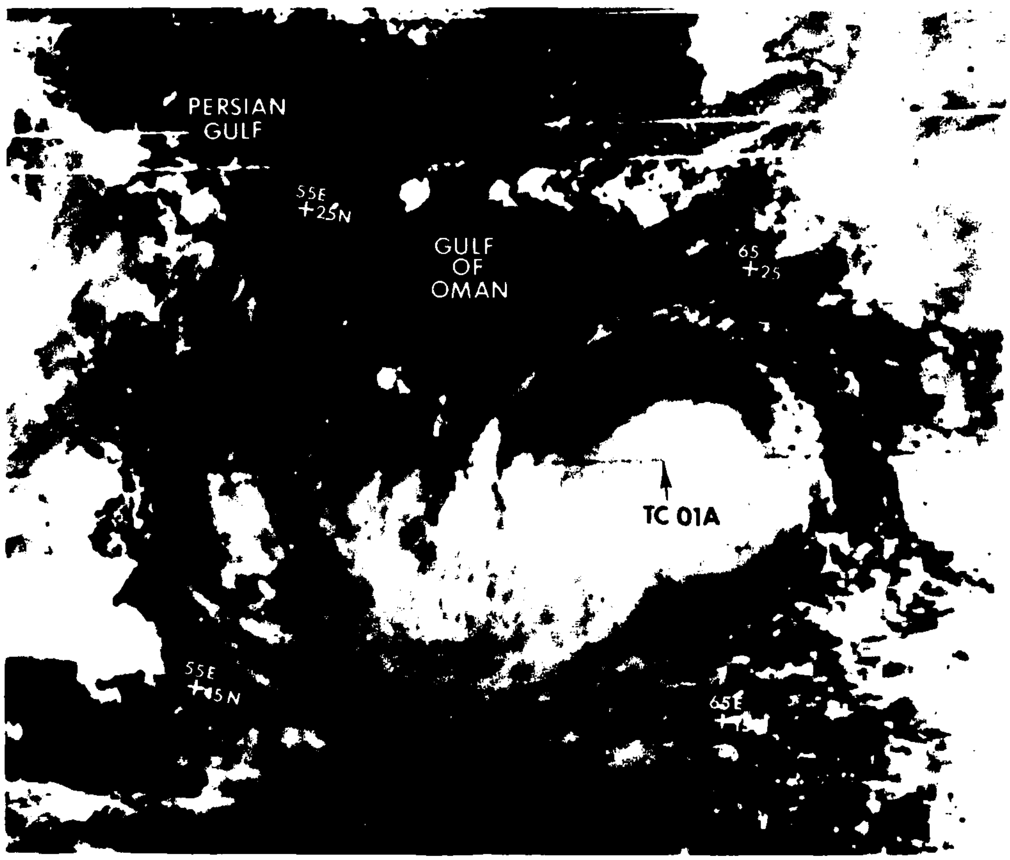
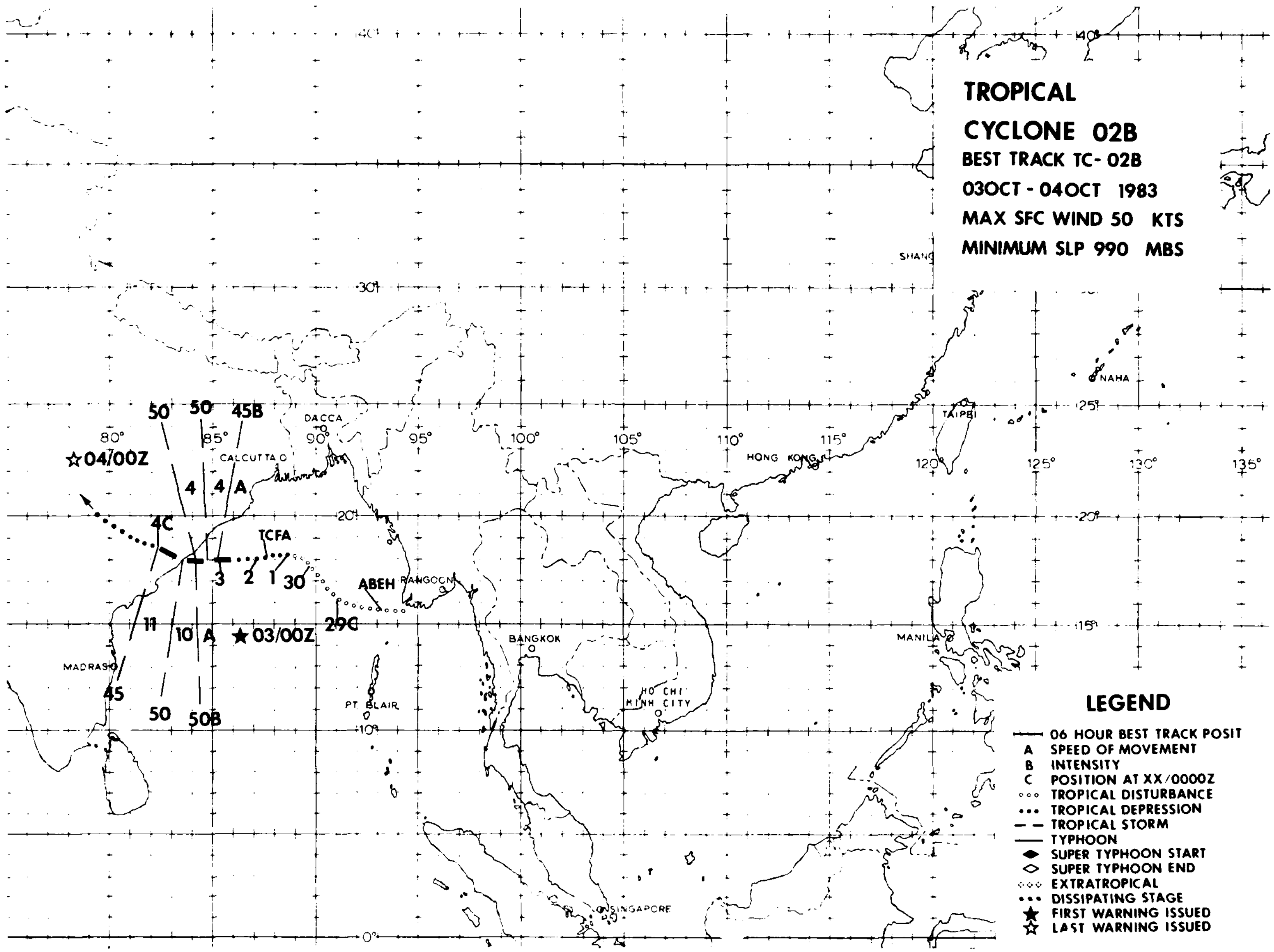


Figure 3-26-1. Tropical Cyclone 01A (Aurora) (091057Z NOAA 7 visual imagery).


TROPICAL
CYCLONE 02B
BEST TRACK TC-02B
03OCT - 04OCT 1983
MAX SFC WIND 50 KTS
MINIMUM SLP 990 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
04/00Z
03/00Z
TCFA
ABEH
29C
30
4C
45B
DACCA
CALCUTTA
RANGOON
MADRAS
PT BLAIR
BANGKOK
HO CHI MINH CITY
SINGAPORE
HONG KONG
MANILA
TAIPEI
NAHA
SHANG

Tropical Cyclone 02B was first detected on 28 September as an area of weakly organized convection located near the southern tip of Burma. Strong upper-level easterly flow over the system inhibitted the formation of outflow channels to the northeast; therefore it moved slowly west-northwestward over the next four days without increasing in organization or intensity. The system eventually moved away from its unfavorable environment and became a significant tropical cyclone.

As Tropical Cyclone 02B continued moving west-northwestward across the Bay of Bengal, its upper-level environment became more favorable for development of the system. Outflow channels became established when the upper-level easterly flow abated over the circulation. A TCFA was issued at 1029Z on the 1st of October in view of the increased potential for further development. This alert was reissued on the 2nd after 24 hours with no further development. The first warning was finally issued at 030000Z. The initial warning on Tropical Cyclone 02B was prompted by satellite imagery which indicated that the system had intensified significantly over the past 24 hours with estimated winds of 45 kt (23 m/s).

The forecast called for continued west-northwestward movement and slight intensification prior to landfal' on the eastern coast of India. Tropi. Cyclone 02B behaved as expected, makir an. fall 20 nm (37 km) northeast of Vi: hapatnam, India at 1700Z on the 3rd of (ber. After making landfall, Tropical Cycl . 02B moved inland over India and dissipa

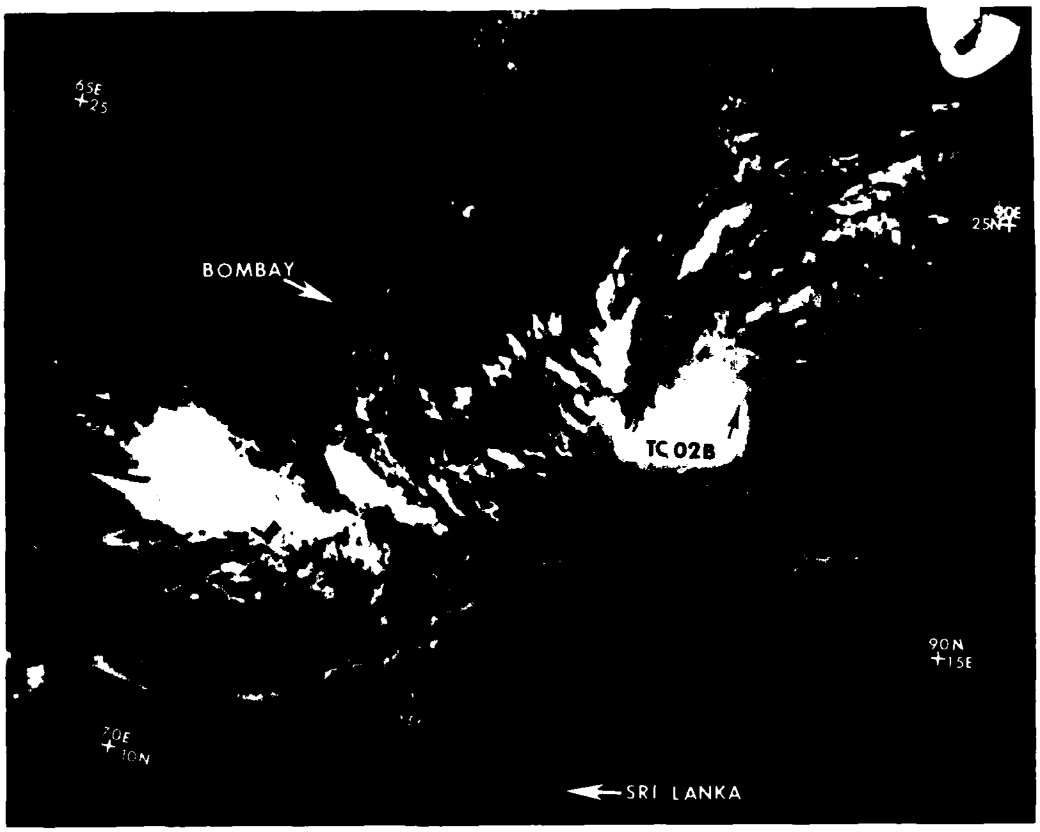
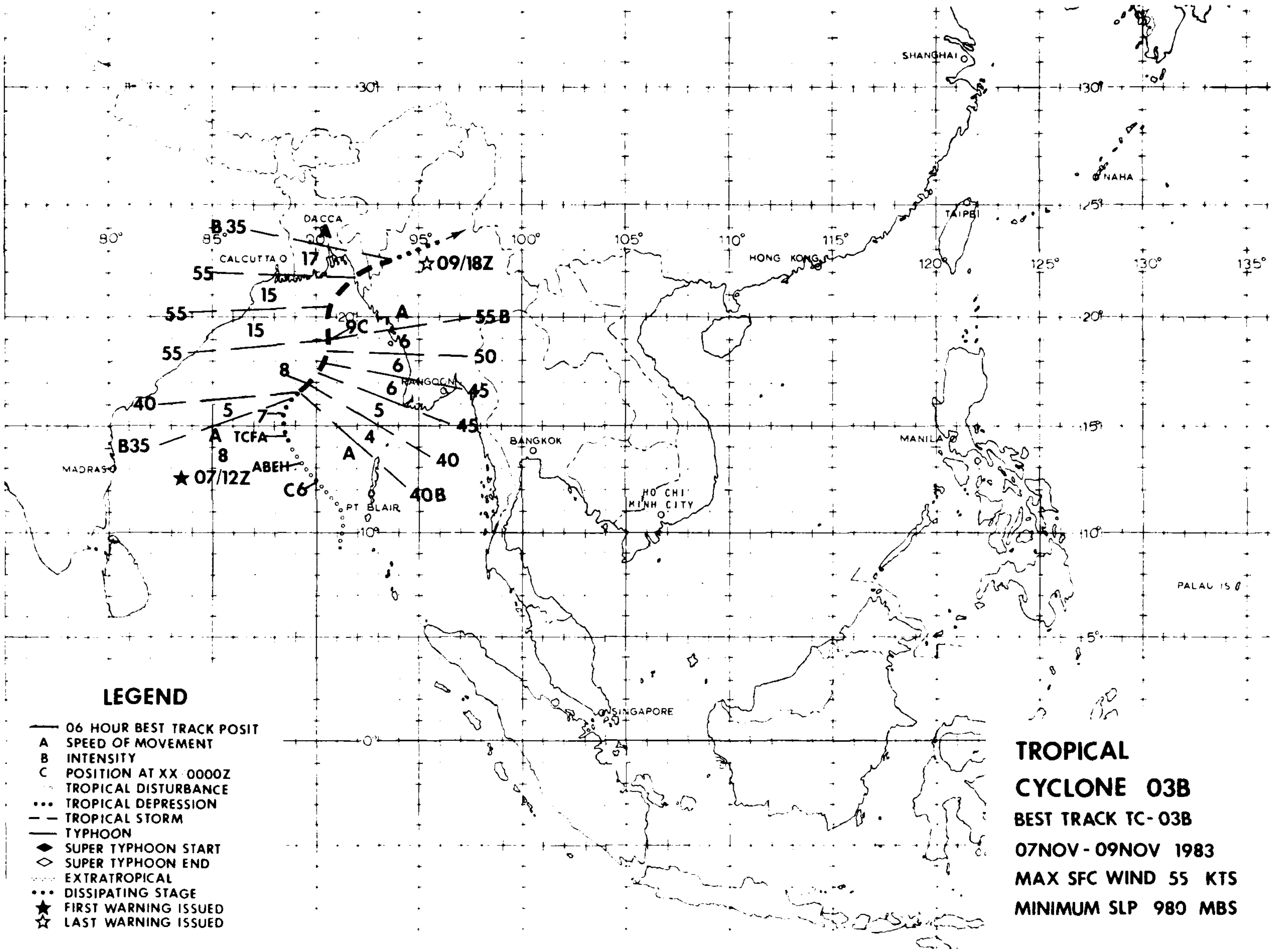


Figure 3-27-1. Tropical Cyclone 02B near maximum intensity seven hours prior to landfall (030948Z October NOAA 7 visual imagery).



LEGEND

- 06 HOUR BEST TRACK POSIT
- A SPEED OF MOVEMENT
- B INTENSITY
- C POSITION AT XX 0000Z
- TROPICAL DISTURBANCE
- TROPICAL DEPRESSION
- TROPICAL STORM
- TYPHOON
- SUPER TYPHOON START
- SUPER TYPHOON END
- EXTRATROPICAL
- DISSIPATING STAGE
- FIRST WARNING ISSUED
- LAST WARNING ISSUED

TROPICAL CYCLONE 03B

BEST TRACK TC-03B

07NOV-09NOV 1983

MAX SFC WIND 55 KTS

MINIMUM SLP 980 MBS

TROPICAL CYCLONE 03B

Tropical Cyclone 03B emerged from the monsoon trough during early November and had a relatively brief and uneventful life. A poorly organized surface circulation in the southern Bay of Bengal had persisted for several days in the monsoon trough. A weak upper-level anticyclone centered over the northern postion of the Bay, placed the low-level circulation in an environment of nondivergent upper-level flow which inhibited further development.

The surface circulation remained poorly organized while moving slowly northward until the 5th of November. At this time, it came into superposition with the upper-level anticyclone which had shifted southward. Over the next 24 hours, satellite imagery indicated the development of convective banding features which prompted the issuance of a TCFA at 1600Z on the 6th.

The circulation continued to intensify while moving north-northwestward. The first warning on Tropical Cyclone 03B was issued at 1444Z on the 7th when satellite intensity estimates reached 35 kt (18 m/s). The lack of synoptic data in the area prompted JTWC to rely on intensity estimates from satellite imagery throughout the life of the cyclone.

After passing the axis of the subtropical ridge, Tropical Cyclone 03B assumed a north-northeastward track and continued to intensify. Maximum intensity of 55 kt (28 m/s) was reached at 0000Z on the 9th. This intensity was maintained until landfall, 12 hours later, on the coast of Bangladesh between Chittagong (WMO 41941) and Cox's Bazar (WMO 41950). Tropical Cyclone 03B continued moving northeastward after landfall and dissipated over northern Burma.

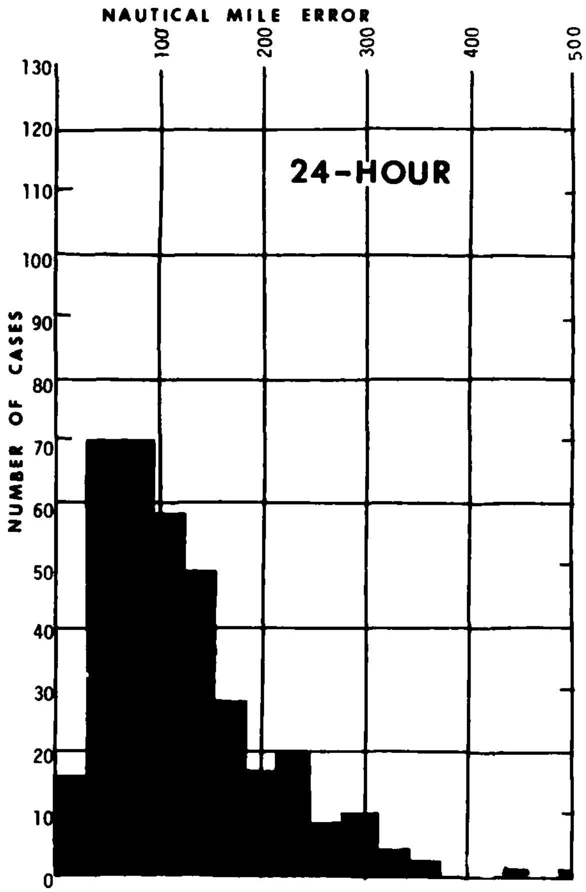
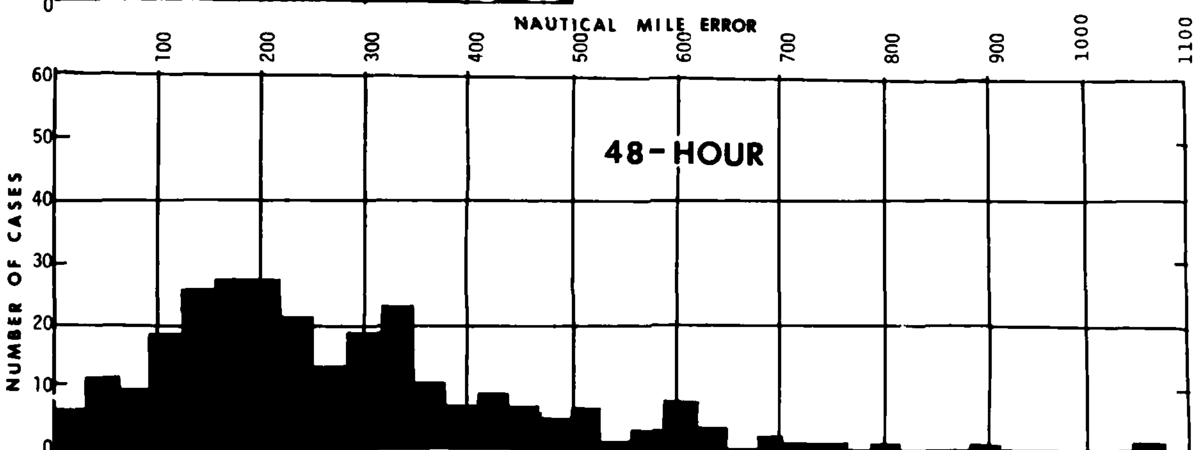


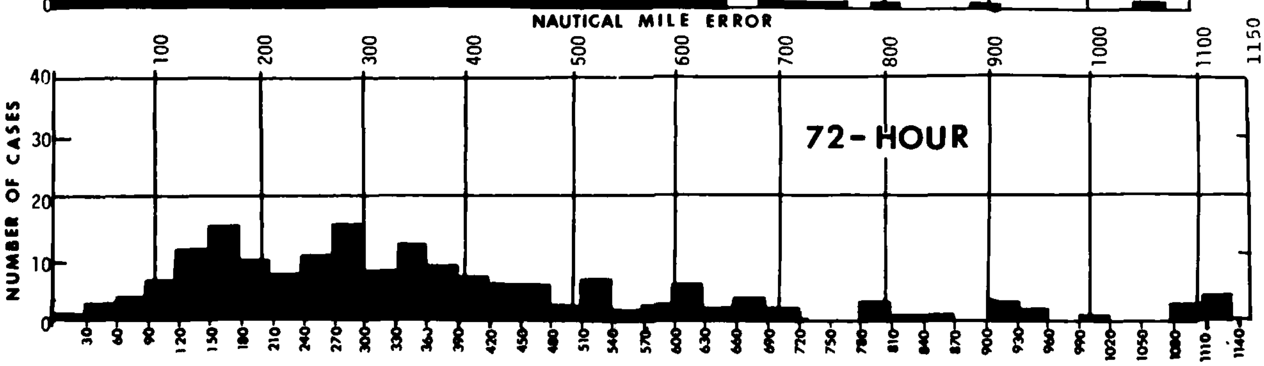
FIGURE 4-2.

Frequency distribution of the 24-, 48-, and 72-hour forecast errors for all significant tropical cyclones in the western North Pacific during the 1983 season.

FORECAST ERRORS (nm)

	24-HR	48-HR	72-HR
MEAN:	117	259	405
MEDIAN:	99	220	331
STANDARD DEVIATION:	76	166	249
CASES:	349	258	187





CHAPTER IV - SUMMARY OF FORECAST VERIFICATION

1. ANNUAL FORECAST VERIFICATION

a. Western North Pacific Ocean

The positions given for warning times and those at the 24-, 48-, and 72-hour forecast times were verified against the post-analysis "best-track" positions at the same valid times. The resultant vector and right angle (track) errors (illustrated in Figure 4-1) were then calculated for each tropical cyclone and are presented in Table 4-1. Figure 4-2 provides the frequency distributions of vector errors for 24-, 48- and 72-hour forecasts of all 1983 tropical cyclones in the western North Pacific. A summation of the mean errors, as calculated for all tropical cyclones in each year, is shown in Table 4-2 for comparative purposes. The data used in this table are not to be confused with that presented in earlier years where the sample was restricted to tropical cyclones that reached typhoon intensity and then had the forecast errors calculated only for that portion of the life-cycle when the intensity was greater than 34 knots (last published as Table 5-1, 1977 Annual Typhoon Report). A comparison of the results using the truncated data set and those obtained for all tropical cyclones can be seen directly in Table 4-3. The annual mean vector errors are graphed in Figure 4-3.

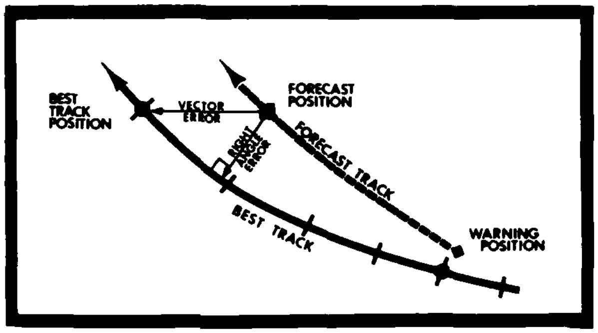


FIGURE 4-1. *Illustration of the method to determine vector error and right angle error.*

TABLE 4-1.

FORECAST ERROR SUMMARY FOR THE WESTERN NORTH PACIFIC SIGNIFICANT TROPICAL CYCLONES OF 1983. (ERRORS IN NM)

	WARNING			24-HOUR			48-HOUR			72-HOUR		
	VECTOR ERROR	RT ANGLE ERROR	NR OF WRNGS	VECTOR ERROR	RT ANGLE ERROR	NR OF WRNGS	VECTOR ERROR	RT ANGLE ERROR	NR OF WRNGS	VECTOR ERROR	RT ANGLE ERROR	NR OF WRNGS
1W. TS SARAH	27	18	6	94	86	3						
2C. TD 02C	36	17	5	168	117	4	276	205	1			
2W. TY TIP	12	8	14	66	53	10	165	160	6	215	204	2
3W. TY VERA	14	9	25	72	39	21	131	66	17	187	70	13
4W. STY WAYNE	12	10	14	96	63	11	226	92	7	454	102	3
5W. STY ABBY	11	8	51	104	84	47	224	199	43	340	307	39
6W. TS CARMEN	20	12	8	199	105	4						
7W. TS BEN	17	12	12	123	41	8	212	46	4			
8W. TS DOM	18	11	23	134	92	19	317	213	13	395	198	7
9W. TD 09W	21	11	4									
10W. TY ELLEN	15	11	47	101	60	43	223	123	39	339	178	35
11W. STY FORREST	11	8	32	97	64	28	224	79	24	366	118	20
12W. TS GEORGIA	10	7	11	53	27	7	52	18	3			
13W. TS HERBERT	18	11	8	33	24	5	43	29	1			
14W. TY IDA	10	6	15	144	58	11	298	95	7	516	25	3
15W. TY JOE	15	10	15	86	61	12	177	151	8	246	200	4
16W. TS KIM	23	11	3	292	55	1						
17W. TY LEX	18	11	18	116	69	14	259	156	10	316	137	5
18W. STY MARGE	19	14	27	191	134	23	484	240	19	755	282	15
19W. TS NORRIS	19	15	7	85	53	3						
20W. TY ORCHID	16	10	38	117	54	33	267	160	30	459	343	26
21W. TY PERCY	21	11	23	173	86	19	409	184	15	650	361	11
22W. TS RUTH	15	8	16	94	56	11	246	162	7	394	353	4
23W. TS SPERRY	33	19	10	149	91	6	343	237	2			
24W. TS THELMA	32	16	10	268	151	6	[illegible]	239	2			
ALL FORECASTS:	16	11	445	117	72	349	259	152	258	405	237	187

TABLE 4-2. ANNUAL MEAN FORECAST ERRORS (NM) FOR THE WESTERN PACIFIC

	24-HOUR		48-HOUR		72-HOUR	
YEAR	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE
1971	111	64	212	118	317	117
1972	117	72	245	146	381	210
1973	108	74	197	134	253	162
1974	120	78	226	157	348	245
1975	138	84	288	181	450	290
1976	117	71	230	132	338	202
1977	148	83	283	157	407	228
1978	127	75	271	179	410	297
1979	124	77	226	151	316	223
1980	126	79	243	164	389	287
1981*	123	75	220	119	334	168
1982*	113	67	237	139	341	206
1983*	117	72	259	152	405	237

* The technique for calculating right angle error was revised in 1981; therefore, a direct correlation in right angle statistics cannot be made for the errors computed before 1981 and the errors computed since 1981.

TABLE 4-3. ANNUAL MEAN FORECAST ERRORS (NM) FOR WESTERN NORTH PACIFIC

	24-HOUR		48-HOUR		72-HOUR	
YEAR	ALL	TYPHOON*	ALL	TYPHOON*	ALL	TYPHOON*
1950-58		170				
1959		117**		267**		
1960		177**		354**		
1961		136		274		
1962		144		287		476
1963		127		246		374
1964		133		284		429
1965		151		303		418
1966		136		280		432
1967		125		276		414
1968		105		229		337
1969		111		237		349
1970	104	98	190	181	279	272
1971	111	99	212	203	317	308
1972	117	116	245	245	381	382
1973	108	102	197	193	253	245
1974	120	114	226	218	348	351
1975	138	129	288	279	450	442
1976	117	117	230	232	338	336
1977	148	140	283	266	407	390
1978	127	120	271	241	410	459
1979	124	113	226	219	316	319
1980	126	116	243	221	389	362
1981	123	117	220	215	334	342
1982	113	114	237	229	341	337
1983	117	110	259	247	405	384

* For Typhoons only while winds were over 35 kt (18 m/sec).

** Forecast positions north of 35°N were not verified.

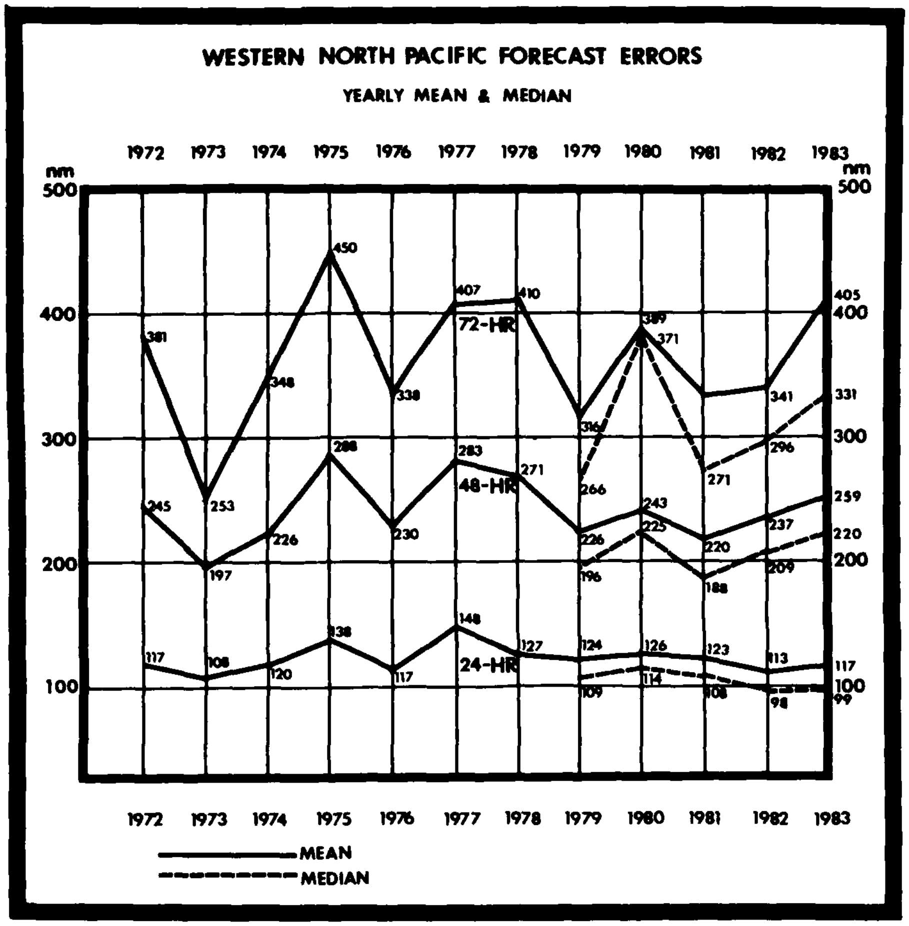


FIGURE 4-3. *Annual mean and median vector errors (nm) for all tropical cyclones in the western North Pacific.*

b. North Indian Ocean

The positions given for warning times and those at the 24-, 48- and 72-hour valid times were verified for tropical cyclones in the North Indian Ocean by the same methods used for the western North Pacific. It should be noted that due to the low number of North Indian Ocean tropical cyclones, these error statistics should not be taken as representative of any trend. Table 4-4 is the forecast error summary for the North Indian Ocean and Table 4-5 contains the annual average of forecast errors back through 1971. Vector errors are plotted in Figure 4-4. (Seventy-two hour forecast errors were evaluated for the first time in 1979).

TABLE 4-4.

FORECAST ERROR SUMMARY FOR THE NORTH INDIAN OCEAN SIGNIFICANT TROPICAL CYCLONES OF 1983. (ERRORS IN NM)

	WARNING			24-HOUR			48-HOUR			72-HOUR		
	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS
1. TC 01A	48	35	3	-	-	-	-	-	-	-	-	-
2. TC 02B	23	25	5	162	114	1	-	-	-	-	-	-
3. TC 03B	42	21	10	109	35	6	153	67	2	-	-	-
ALL FORECASTS:	38	24	18	117	46	7	153	67	2			

TABLE 4-5.

ANNUAL MEAN FORECAST ERRORS FOR THE NORTH INDIAN OCEAN

	24-HOUR		48-HOUR		72-HOUR	
YEAR	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE
1971*	232	-	410	-	-	-
1972*	224	101	292	112	-	-
1973*	182	99	299	160	-	-
1974*	137	81	238	146	-	-
1975	145	99	228	144	-	-
1976	138	108	204	159	-	-
1977	122	94	292	214	-	-
1978	133	86	202	128	-	-
1979	151	99	270	202	437	371
1980	115	73	93	87	167	126
1981**	109	65	176	103	197	73
1982**	138	66	368	175	762	404
1983**	117	46	153	67	-	-

* The western Bay of Bengal and the Arabian Sea were not included in the JTWC area of responsibility until the 1975 tropical cyclone season.

** The technique for calculating right angle error was revised in 1981; therefore, a direct correlation in right angle statistics cannot be made for the errors computed before 1981 and the errors computed since 1981.

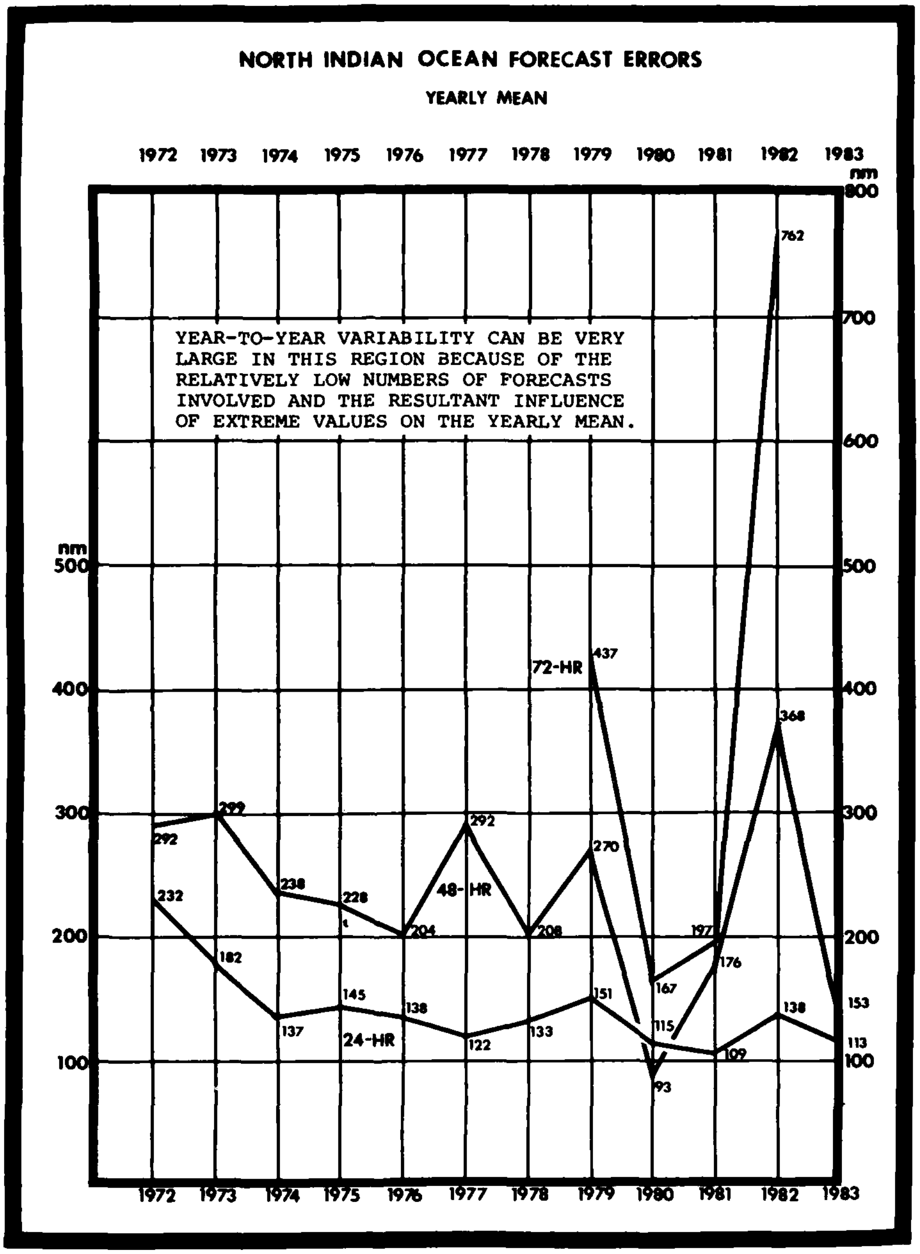


FIGURE 4-4. *Annual mean vector errors (nm) for all tropical cyclones in the North Indian Ocean.*

2. COMPARISION OF OBJECTIVE TECHNIQUES

a. General

Objective techniques used by JTWC are divided into five main categories:

(1) climatological and analog techniques;

(2) extrapolation;

(3) steering techniques;

(4) dynamic models;

(5) empirical and analytical techniques

In September 1981, JTWC began to initialize its array of objective forecast techniques (described below) on the six-hour-old preliminary best track position (an interpolative process) rather than the forecast (partially extrapolated) warning position, e.g. the 0600Z warning is now supported by objective techniques developed from the 0000Z preliminary best track position. This operational change has yielded several advantages:

*techniques can now be requested much earlier in the warning development time line, i.e. as soon as the track can be approximated by one or more fix positions on, or after the valid time of the previous warning;

*receipt of these techniques is virtually assured prior to development of the next warning

*improved (mean) forecast accuracy.

This latter aspect arises because JTWC now has a more reliable approximation of the short-term tropical cyclone movement. Further, since most of the objective techniques are biased for persistence, this new procedure optimizes their performance and provides more consistent guidance on short-term movement, indirectly yielding a more accurate initial position estimate as well as lowering 24-hour forecast errors.

b. Description of Objective Techniques

(1) CLIM -- A climatological aid providing 24-, 48- and 72-hour tropical cyclone forecast positions (and intensity changes in the western North Pacific) based upon the position of the tropical cyclone. The output is based upon data records from 1945 to 1981 for the western North Pacific Ocean and 1900 to 1981 for the North Indian Ocean.

(2) TYAN78 -- An updated analog program which combines the earlier versions TYFN 75 and INJAH 74. The program scans history tapes for tropical cyclones similar (within a specified acceptance envelope) to the current tropical cyclone. For the western North Pacific Ocean, three forecasts of position and intensity are provided for 24-, 48- and 72-hours: RECR - a weighted mean of all accepted tropical cyclones which were categorized as "recurving" during their best track period; STRA - a weighted mean of all accepted tropical cyclones which were categorized as moving "straight" (westward) during their best track period; and TOTL - a weighted mean of all accepted tropical cyclones, including those used in the RECR and STRA forecasts. For the North Indian Ocean, a single (total) forecast track is provided for 12-hour intervals to 72 hours.

(3) BPAC -- A program which generates 12- to 72-hour forecast positions based on blending the past motion of the tropical cyclone with the CLIM forecast positions. The blending routine gives less weight to persistence at each succeeding forecast interval.

(4) XTRP -- Forecast positions for 24- and 48-hours are derived from the extension of a straight line which connects the most-recent and 12-hour-old preliminary best track positions.

(5) HPAC -- 24- and 48-hour forecast positions are derived by merely connecting the mid-points of straight lines which connect these positions on the XTRP and CLIM tracks, respectively.

(6) CYCLOPS -- An updated version of the HATTRACK/MOHATT steering program which can provide geostrophic steering forecasts at the 1000-, 850-, 700-, 500-, 400-, and 200-mb levels. The program can be run in a modified (includes a 12-hour persistence bias) or unmodified mode applied to either analysis or prognostic fields. The program advects a point vortex on a preselected analysis and/or smoothed prognostic field at designated levels in six-hour time steps through 72 hours. In 1983, only the modified version, in the prognostic mode for the 500-mb level was verified; however, JTWC routinely uses many of the other levels and modes as operational forecast aids.

(7) OTCM -- (One-way Tropical Cyclone Model) A coarse-mesh, three-layer in the vertical, primitive equation model with a 205 km grid spacing over a 6400 x 4700 km domain. The model's fields are computed around a bogused, digitized cyclone vortex using FLENUMOCEANCEN Global Bands prognostic fields for the specified valid time. The past motion of the tropical cyclone is compared to initial steering fields and a bias correction is computed and applied to the model. FLENUMOCEANCEN hemispheric prognostic fields are used at 12-hour intervals to update the model's boundaries. The resultant forecast positions are derived by locating the 850 mb vortex at six-hour intervals to 72 hours. In 1983, the OTCM was requested for each warning; and when computer resources were available, the OTCM forecast was normally available to the TDO within one hour of the request.

(8) NTCM -- (Nested Tropical Cyclone Model) A primitive equation model with similar properties as the OTCM. The NTCM differs by containing a finer scale "nested" grid, initializing on Global Bands analysis fields, not containing a (persistence) bias correction, and being a channel model which runs independent of FLENUMOCEANCEN prognostic fields (not requiring updating of its boundaries). The "nested" grid covers a 1200 x 1200 km area with a 41 km grid spacing which moves within the coarse-mesh domain to keep an 850 mb vortex at its center.

(9) TAPT -- A technique which utilizes upper-tropospheric wind fields to estimate the latitude of initial acceleration associated with the tropical cyclone's interaction with the mid-latitude westerly steering currents. Further, the technique provides speed of movement guidelines for duration and upper-limits, and insight on the probable path of the tropical cyclone, given a prevailing upper-wind pattern during the acceleration process.

(10) THETA E -- An empirically derived relationship between a tropical cyclone's minimum sea level pressure (MSLP) and (700 mb) equivalent potential temperature (θ_e) was developed by Sikora (1976) and Dunnavan (1981). By monitoring MSLP and θ_e trends, the forecaster can evaluate the potential for sudden, rapid deepening of a tropical cyclone.

(11) WIND RADIUS -- Following an analytic model of the radial profiles of sea level pressures and winds in mature tropical cyclones (Holland, 1980), a set of radii for 30-, 50-, and 100-knot winds based on the tropical cyclone's maximum intensity and radius of maximum winds have been produced to aid the forecaster in determining forecast wind radii.

(12) DVORAK -- An estimation of a tropical cyclone's current and 24-hour forecast intensity is made from interpretation of visual satellite imagery (Dvorak, 1973) and provided to the forecaster. These intensity estimates are used in conjunction with other intensity-related data and trends to forecast tropical cyclone intensity.

c. Testing and Results

A comparison of selected techniques is included in Table 4-6 for all western North Pacific tropical cyclones and in Table 4-7 for all North Indian Ocean tropical cyclones. In these tables, "X-AXIS" refers to techniques listed vertically. The example in Table 4-6 compares CY50 to OTCM, i.e. in the 273 cases available for a (homogeneous) comparison, the average vector error at 24 hours was 114 nm for CY50 and 105 for OTCM. The difference of 8 nm is shown in the lower right. (Differences are not always exact, due to computational round-off which occurs for each of the cases available for comparison).

TABLE 4-6. 1983 ERROR STATISTICS FOR SELECTED OBJECTIVE TECHNIQUES IN THE WESTERN NORTH PACIFIC OCEAN

24-HOUR FORECAST ERRORS (NM)

24-	JTWC	RECR	STRA	TOTL	CY50	NTCM	OTCM	BPAC	CLIM	XTRP	HPAC
JTWC	349 117										
	117 0										
RECR	310 113	310 126									
	126 13	126 0									
STRA	317 114	299 121	317 133								
	133 18	127 6	133 0								
TOTL	328 117	309 126	316 133	328 120							
	120 4	113 -11	117 -15	120 0							
CY50	321 117	293 126	296 132	307 119	321 114						
	114 -1	111 -14	111 -20	113 -5	114 0						
NTCM	274 119	239 122	248 137	257 122	251 109	274 161					
	161 42	157 35	154 17	161 39	164 54	161 0					
OTCM	288 118	258 124	260 131	271 119	273 114	232 162	289 107				
	104 -13	101 -23	100 -30	104 -13	105 -8	101 -59	107 0				
BPAC	323 117	292 126	298 133	309 121	301 114	255 161	273 103	323 128			
	128 11	124 -1	122 -10	126 6	128 14	127 -33	127 24	128 0			
CLIM	341 116	307 126	314 133	325 121	315 114	268 160	282 103	323 128	341 148		
	148 32	141 15	144 11	150 29	150 36	152 -7	147 44	148 20	148 0		
XTRP	341 117	305 126	311 134	322 121	316 115	268 161	282 104	321 128	337 149	341 112	
	112 -4	111 -14	108 -24	111 -9	112 -1	109 -50	113 9	113 -14	112 -36	112 0	
HPAC	337 117	305 126	311 134	322 121	313 114	264 160	280 103	321 128	337 149	337 112	337 111
	111 -4	106 -18	107 -25	111 -8	112 -1	113 -46	111 8	111 -16	111 -36	111 0	111 0

NUMBER OF CASES	X-AXIS TECHNIQUE ERROR
Y-AXIS TECHNIQUE ERROR	ERROR DIFFERENCE Y - X

48-HOUR FORECAST ERRORS (NM)

48-	JTWC	RECR	STRA	TOTL	CY50	NTCM	OTCM	BPAC	CLIM	XTRP	HPAC
JTWC	258 259										
	259 0										
RECR	233 252	235 236									
	235 -17	236 0									
STRA	238 259	228 230	240 284								
	282 23	274 44	284 0								
TOTL	246 261	235 236	240 284	248 253							
	252 -9	236 0	250 -34	253 0							
CY50	237 260	223 239	224 283	232 248	239 319						
	318 59	321 83	321 38	322 74	319 0						
NTCM	200 270	179 232	185 292	192 258	185 326	202 250					
	251 -19	240 7	240 -50	250 -7	252 -73	250 0					
OTCM	209 262	192 234	193 276	200 245	199 318	166 246	211 202				
	200 -60	193 -40	192 -83	201 -44	204 -113	201 -44	202 0				
BPAC	241 261	221 236	225 286	233 251	225 326	191 248	200 200	243 241			
	241 -19	230 -5	233 -52	237 -13	241 -83	240 -7	237 37	241 0			
CLIM	254 261	232 235	237 286	245 254	238 320	200 249	207 201	243 241	256 262		
	261 0	249 13	255 -30	262 9	263 -57	274 25	254 53	258 17	262 0		
XTRP	252 260	230 235	234 286	242 253	234 316	198 249	205 201	241 242	253 261	254 239	
	239 -21	234 0	237 -47	238 -14	242 -73	232 -17	240 39	242 0	240 -20	239 0	
HPAC	251 261	230 235	234 286	242 253	234 316	197 250	205 201	241 242	253 261	253 240	253 211
	210 -50	200 -34	205 -79	210 -42	212 -102	215 -33	208 7	210 -31	211 -49	211 -28	211 0

JTWC - OFFICIAL JTWC FORECAST
RECR - RECURVER (TYAN 78)
STRA - STRAIGHT (TYAN 78)
TOTL - TOTAL (TYAN 78)
CY50 - CYCLOPS MODIFIFD 500 MB PROG
NTCM - NESTED TROPICAL CYCLONE MODEL
OTCM - ONE-WAY TROPICAL CYCLONE MODEL
BPAC - BLENDED PERSISTENCE AND CLIM
CLIM - CLIMATOLOGY
XTRP - 12-HOUR EXTRAPOLATION
HPAC - MEAN OF XTRP AND CLIM

72-HOUR FORECAST ERRORS (NM)

72-	JTWC	RECR	STRA	TOTL	CY50	NTCM	OTCM	BPAC	CLIM
JTWC	187 405								
	405 0								
RECR	171 388	176 359							
	359 -28	359 0							
STRA	173 393	169 350	177 418						
	410 17	404 54	418 0						
TOTL	180 402	176 359	177 418	185 389					
	389 -13	366 7	385 -31	389 0					
CY50	171 393	167 364	164 402	172 368	176 522				
	526 132	533 169	520 117	530 161	522 0				
NTCM	149 412	137 348	139 438	146 404	139 540	152 336			
	335 -77	325 -22	316 -121	338 -66	336 -203	336 0			
OTCM	145 407	139 355	136 412	144 381	142 509	123 337	150 347		
	344 -62	336 -18	321 -90	343 -37	349 -160	346 9	347 0		
BPAC	171 405	163 361	163 417	171 382	163 532	142 332	140 346	176 359	
	354 -50	334 -26	337 -79	349 -32	350 -181	359 28	349 3	359 0	
CLIM	183 405	173 357	175 418	182 388	173 524	150 333	146 346	175 357	188 341
	340 -64	319 -37	332 -85	337 -50	333 -190	356 23	319 -25	334 -22	341 0

TABLE 4-7. 1983 ERROR STATISTICS FOR SELECTED OBJTECTIVE TECHNIQUES IN THE NORTH INDIAN OCEAN

24-HOUR FORECAST ERRORS (NM)

24-	JTWC		TOTL		NTCM		CY50		CY85		OTCM		BPAC		CLIM		XTRP		HPAC	
JTWC	10	113																		
	113	0																		
TOTL	9	114	9	109																
	109	-4	109	0																
NTCM	0	0	0	0	0	0														
	0	0	0	0	0	0														
CY50	8	102	8	101	0	0	8	273												
	273	171	273	172	0	0	273	0												
CY85	8	102	8	101	0	0	8	273	8	157										
	157	55	157	56			157	-115	157	0										
OTCM	6	130	6	118	0	0	5	266	5	174	6	165								
	165	35	165	47	0	0	147	-119	147	-26	165	0								
BPAC	9	114	9	109	0	0	8	273	8	157	6	165	9	97						
	97	-16	97	-11	0	0	95	-177	95	-61	112	-52	97	0						
CLIM	10	113	9	109	0	0	8	273	8	157	6	165	9	97	10	95				
	95	-18	97	-11	0	0	90	-182	90	-66	92	-72	97	0	95	0				
XTRP	10	113	9	109	0	0	8	273	8	157	6	165	9	97	10	95	10	135		
	135	21	130	20	0	0	120	-152	120	-37	142	-23	130	33	135	40	135	0		
HPAC	10	113	9	109	0	0	8	273	8	157	6	165	9	97	10	95	10	135	10	103
	103	-9	105	-3	0	0	96	-176	96	-60	112	-52	105	9	103	9	103	-31	103	0

NUMBER OF CASES	X-AXIS TECHNIQUE ERROR
Y-AXIS TECHNIQUE ERROR	ERROR DIFFERENCE Y - X

48-HOUR FORECAST ERRORS (NM)

48-	JTWC		TOTL		NTCM		CY50		CY85		OTCM		BPAC		CLIM		XTRP		HPAC	
JTWC	2	153																		
	153	0																		
TOTL	2	153	2	84																
	84	-68	84	0																
NTCM	0	0	0	0	0	0														
	0	0	0	0	0	0														
CY50	2	153	2	84	0	0	2	505												
	505	353	505	421	0	0	505	0												
CY85	2	153	2	84	0	0	2	505	2	435										
	435	282	435	351	0	0	435	-70	435	0										
OTCM	2	153	2	84	0	0	2	505	2	435	2	304								
	304	152	304	220	0	0	304	-200	304	-129	304	0								
BPAC	2	153	2	84	0	0	2	505	2	435	2	304	2	113						
	113	-39	113	29	0	0	113	-391	113	-321	113	-191	113	0						
CLIM	2	153	2	84	0	0	2	505	2	435	2	304	2	113	2	273				
	273	120	273	189	0	0	273	-231	273	-161	273	-30	273	160	273	0				
XTRP	2	153	2	84	0	0	2	505	2	435	2	304	2	113	2	273	2	145		
	145	-7	145	61	0	0	145	-360	145	-289	145	-159	145	32	145	-127	145	0		
HPAC	2	153	2	84	0	0	2	505	2	435	2	304	2	113	2	273	2	145	2	205
	205	52	205	120	0	0	205	-300	205	-229	205	-99	205	92	205	-67	205	60	205	0

JTWC - OFFICIAL JTWC FORECAST
TOTL - ANALOG (TYAN 78)
NTCM - NESTED TROPICAL CYCLONE MODEL
CY85 - CYCLOPS MODIFIED 850 MB PROG
CY50 - CYCLOPS MODIFIED 500 MB PROG
OTCM - ONE-WAY TROPICAL CYCLONE MODEL
BPAC - BLENDED PERSISTENCE AND CLIM
CLIM - CLIMATOLOGY
XTRP - 12-HOUR EXTRAPOLATION
HPAC - MEAN OF XTRP AND CLIM

CHAPTER V - APPLIED TROPICAL CYCLONE RESEARCH SUMMARY

1 NAVENVPREDRSCHFAC RESEARCH

TROPICAL CYCLONE HAVEN STUDIES

(Brand, S., NAVENVPREDRSCHFAC)

Tropical cyclone haven studies are being developed for 22 ports and harbors in the Atlantic and Gulf of Mexico, and being published in the Hurricane Havens Handbook for the North Atlantic Ocean (NAVENVPREDRSCHFAC Technical Report 82-03) as available. In addition, Pearl Harbor is presently being evaluated as a hurricane haven.

THE NAVY TWO-WAY INTERACTIVE NESTED TROPICAL CYCLONE MODEL (NTCM)

(Fiorino, M., NAVENVPREDRSCHFAC)

1983 was the first year the CY205 version of the NTCM went into operational evaluation (OPEVAL). Results in WESTPAC were significantly better than for the 1982 OPEVAL version that was run on the CY175. We have further demonstrated that the NTCM, and other dynamic models, are capable of producing better forecasts than climatology-persistence aids, particularily for the long range (48-72 hours) and the general track. However, the model's performance on very large storms, like supertyphoon Abby, has forced us to consider expanding the fine mesh so that the tropical cyclone circulation is always contained within the high-resolution grid.

We will experiment with the bias-corrector technique that forces initial model storm motion to be the same as that observed. We anticipate significant improvements in short term (12-24 hours) skill as well as for the longer term. We will also test time-dependent boundary conditions, after the bias corrector has been implemented. Monitoring of the performance of the CY205 NTCM in the southern hemisphere will continue.

TROPICAL CYCLONE OPTIMUM FORECAST AID

(Tsui, T., NAVENVPREDRSCHFAC)

A comprehensive review of the performance of all JTWC objective tropical cyclone forecast aids shows that during 1979-82 the "one-way tropical cyclone" model (OTCM) has the best overall performance. The "nested tropical cyclone" model (NTCM) has the superior track prediction ability, while the OTCM has the best speed of tropical cyclone movement forecast. The blend of climatology (CLIM) and persistence (XTRP) is still a good objective aid.

Through experiments, two alternate objective aids are suggested. One; JTWC forecasters are recommended to use NTCM as a track forecaster and to use one statistical aid's output as the guide of the speed forecast. This statistical aid's forecast track should be closest to the NTCM track. Two; the blending of the CLIM and the XTRP is recommended to be 1:3, 2:2, 3:1 for the 24-, 48-, and 72-hr forecast respectively.

TROPICAL CYCLONE OBJECTIVE FORECAST CONFIDENCE AND DISPLAY SYSTEM

(Nuttall, K., System and Applied Sciences Corp., Tsui, T., NAVENVPREDRSCHFAC)

The system has been installed on FNOC operational computers at the end of 1983. Forecasters at JTWC now can issue one single ARQ command to activate up to 12 objective tropical cyclone forecast aids. The results of the activated objective aids will return to the system for coordination for dissemination of the forecast guidance and the display graphics; and for archival of all objective aid forecasts. The system is also capable of processing JTWC's official forecasts and best track information; and can be applied to western North Pacific, Indian Ocean, and Southern Hemisphere regions.

A weighted combined tropical cyclone forecast composed from all available objective aids is issued upon each combined ARQ request. The weights of the combination are reduced from the past (1979-82) performance of the aids.

SATELLITE BASED TROPICAL CYCLONE INTENSITY FORECASTS

(Cook, J. and T. Tsui, NAVENVPREDRSCHFAC

Results from a recently completed study show the usefulness of a newly developed objective spiral analysis technique as a forecasting aid. Algorithms using persistence and derived spiral parameters show significant skill at estimating current intensity and in making 12 hour intensity forecasts. The 24 hour intensity forecasting skill is only slightly better than persistence. This nowcasting skill is unique because of the stand-alone nature of the SPADS based method.

Also under investigation is a method of studying the relationship of cyclone intensity and cloud patterns in quasi-Lagrangian coordinates. Satellite images of tropical cyclones are rotated and correlated with various intensity parameters.

SYNOPTIC TROPICAL CYCLONE INTENSITY FORECAST

(Gray, W., Colorado State University)

Extensive investigation on tropical cyclone intensity change characteristics is now underway. The study will include: (1) individual case analysis tropical cyclone intensity change with FGGE year and JTWC hand analysis and (2) rawinsonde composite analysis of groups of cyclones experiencing rapid, moderate, weak and negative intensity change. The goal of this study is to develop practical empirical relationships for cyclone intensity change which can be used in an operational forecast environment such as exists at JTWC.

TROPICAL CYCLONE INTENSITY FORECASTS USING THE VERTICAL WIND SHEAR

(Cook, J., and T. Tsui, NAVENVPRDRSCHFAC)

A study of the relationship of tropical cyclone intensity to the large-scale vertical wind shear is currently underway. The data being used are various combinations of the radially averaged vertical shear of the Global Band zonal-wind component for all the western North Pacific tropical cyclones from 1974-81. The wind shear parameters will be related to cyclone intensity by using linear regression techniques.

TROPICAL CYCLONE STRIKE AND WIND PROBABILITIES

Tropical cyclone strike and wind probability is a method for determining up through 72 hours that a tropical cyclone will affect geographic points of interest to the user. Applications presently being developed, tested and implemented for the western North Pacific, and North Indian Ocean, western North Atlantic, and Gulf of Mexico include: strike/wind probabilities and geographic depictions; optimum track ship routing (OTSR) aids; HP-9845/Tactical Environmental Support System (TESS) software for shipboard environmentalists and decision makers; terrain adjusted probabilities; and condition setting aids.

STATISTICAL TROPICAL CYCLONE FORECASTING AIDS FOR THE SOUTHERN HEMISPHERE

(Keenan, T., Bureau of Meteorology, Australia)

Various statistical techniques are being tested for use by JTWC in the southern hemisphere. Australian schemes using multiple linear regression, eigenvector and discriminant analysis of past track data and synoptic data, are being run on 82/83 storm data over the JTWC area of responsibility. In addition, a technique incorporating both geographic and track orientated prediction schemes is being developed using the FNOC Global Band fields as the developmental data base.

?. PUBLICATIONS

Allen, R.L., 1984: COSMOS: CYCLOPS Objective Steering Model Output Statistics. Proceedings, 15th Technical Conference on Hurricanes and Tropical Meteorology.

COSMOS, a new objective aid used in forecasting the movement of western North Pacific tropical cyclones, is presented. The aid accepts CYCLOPS forecasts at the 850, 700, and 500 mb levels and produces its own forecast based on a statistical analysis of the past performance of CYCLOPS. The design of COSMOS as well as the results of the statistical analysis are presented. Verification of COSMOS during the first eight months of 1983 indicates that the technique may be an improvement over other techniques currently available at JTWC.

Weir, R.C., 1984: Predicting the Acceleration of Northward-moving Tropical Cyclones Using Upper-Tropospheric Winds. Proceedings, 15th Technical Conference on Hurricanes and Tropical Meteorology.

Inconsistent forecasting of the acceleration of northward-moving tropical cyclones entering the domain of the mid-latitude westerlies has been a long-standing weakness in tropical cyclone forecasting. The tracks of tropical cyclones traversing a relative high-density data area of the western North Pacific have been analyzed to verify the acceleration phenomenon, and to correlate the movement with features of the upper-tropospheric wind field. The resultant forecast technique is described and the results obtained with its use during the 1982 tropical cyclone season in the western North Pacific are presented.

Weir, R.C., 1983: Tropical Cyclones Affecting Guam (1671-1980). NAVOCEANCOMCEN/JTWC TECH NOTE 83-1.

An update of a previous paper (Holliday, 1975) which presents a climatology of tropical cyclones passing within 180 nm of Guam for the period 1948 to 1980. A review of all typhoons of the 1600's is included. The survey encompasses the frequency, behavior, meteorological effects and descriptive chronicles of Guam tropical cyclones. The major emphasis is on the period since World War II.

TROPICAL STORM SARAH
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		WIND	WARNING POSIT		WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND
061900Z	5.9	136.3	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
061906Z	6.4	135.6	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
061912Z	7.0	134.9	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
061918Z	7.4	134.1	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062000Z	7.8	133.3	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062006Z	7.9	132.3	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062012Z	8.1	131.2	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062018Z	8.3	130.2	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062100Z	8.6	129.0	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062106Z	8.8	127.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062112Z	9.3	126.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062118Z	9.9	125.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062200Z	10.4	123.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062206Z	11.4	121.7	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062212Z	12.2	120.4	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062218Z	12.7	119.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062300Z	12.7	117.5	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062306Z	12.8	116.3	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062312Z	12.8	115.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062318Z	12.8	114.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062400Z	12.8	113.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062406Z	12.9	112.2	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062412Z	13.6	111.6	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062418Z	14.3	111.1	30	14.8	110.8	30.	35.	0.	18.1	108.0	35.	103.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062500Z	15.0	110.6	30	15.2	110.5	30.	13.	0.	17.9	107.7	35.	76.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062506Z	15.7	109.9	35	15.6	109.8	35.	8.	0.	18.2	107.5	45.	105.	30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062512Z	16.2	109.2	35	16.3	109.5	30.	10.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062518Z	16.4	108.2	30	17.4	109.0	25.	76.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062600Z	16.7	107.3	25	16.5	107.3	25.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062606Z	16.8	106.4	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	27.	94.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	18.	86.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	2.	15.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-2.	15.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	6	3	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1940. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 11. KNOTS

TROPICAL STORM SARAH
FIX POSITIONS FOR CYCLONE NO. 1

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
*	1	170000	6.5N 138.5E	PCN 6	T0.0/0.0	INIT OBS ULCC FIX	PGTW
	2	182025	5.3N 136.5E	PCN 4	T0.5/0.5	INIT OBS	PGTW
	3	190610	6.1N 136.4E	PCN 5	T1.0/1.0		RPMK
*	4	192146	7.0N 135.0E	PCN 6	T0.5/0.5 /S0.0/25HRS		PGTW
	5	200000	7.9N 133.2E	PCN 6			PGTW
	6	200300	7.9N 132.4E	PCN 6			PGTW
*	7	200558	9.5N 132.0E	PCN 5	T1.0/1.0 /D0.5/08HRS		PGTW
*	8	201007	9.5N 131.1E	PCN 5		ULCC FIX	PGTW
*	9	201200	9.4N 131.1E	PCN 6		ULCC FIX	PGTW

* 10	201600	9.6N 130.4E	PCN 6	T1.0/1.0 /D0.5/10HRS	ULCC FIX	PGTW
* 11	201800	9.4N 130.5E	PCN 6		ULCC FIX	PGTW
* 12	202125	9.5N 130.1E	PCN 5		ULCC FIX	PGTW
* 13	210000	9.9N 128.4E	PCN 5		ULCC FIX	PGTW
14	210300	8.1N 128.8E	PCN 5			PGTW
15	211200	9.9N 125.6E	PCN 6		ULCC FIX	PGTW
16	211600	9.8N 125.1E	PCN 6		ULCC FIX	PGTW
17	211800	10.0N 124.6E	PCN 6		ULCC FIX	PGTW
18	212100	10.0N 124.1E	PCN 6		ULCC FIX	PGTW
19	220000	10.5N 123.9E	PCN 6		ULCC FIX	PGTW
* 20	220300	10.6N 124.2E	PCN 6	T0.0/0.0	ULCC FIX	PGTW
21	230000	13.8N 117.5E	PCN 6			PGTW
* 22	230300	14.2N 116.0E	PCN 6	T0.0/0.0 /S0.0/24HRS		PGTW
23	240000	13.3N 113.2E	PCN 6	T1.5/1.5-/D1.5/21HRS	ULCC FIX	PGTW
24	240300	13.2N 112.9E	PCN 6		ULCC FIX	PGTW
25	240600	13.3N 112.4E	PCN 6		ULCC FIX	PGTW
26	240651	13.4N 113.4E	PCN 5	T2.0/2.0	INIT OBS	RPMK
27	240900	13.9N 111.7E	PCN 6		ULCC FIX	PGTW
28	241200	14.3N 111.6E	PCN 6	T1.5/1.5 /S0.0/12HRS	ULCC FIX	PGTW
29	241600	14.6N 111.0E	PCN 6			PGTW
30	241800	14.6N 110.5E	PCN 6			PGTW
31	242100	14.5N 110.3E	PCN 6			PGTW
* 32	242323	15.5N 111.8E	PCN 5	T1.5/2.0-/W0.5/14HRS		RPMK
33	250000	15.1N 110.8E	PCN 6	T1.5/1.5-/S0.0/12HRS	ULCC FIX	PGTW
34	250041	15.6N 111.1E	PCN 5	T1.5/2.0-/W0.5/16HRS		RPMK
35	250300	15.2N 110.0E	PCN 6		ULCC FIX	PGTW
36	250600	15.6N 109.9E	PCN 6		ULCC FIX	PGTW
37	250820	16.0N 109.8E	PCN 3	T1.5/2.0-/W0.5/25HRS		RPMK
38	250900	15.5N 109.6E	PCN 6		ULCC FIX	PGTW
39	251140	16.4N 109.3E	PCN 3			RPMK
40	251140	16.3N 109.5E	PCN 6			RODN
41	251200	16.4N 108.7E	PCN 6			PGTW
42	251600	16.7N 108.0E	PCN 6	T1.5/1.5-/S0.0/16HRS		PGTW
* 43	251800	16.8N 107.2E	PCN 6			PGTW
44	252100	17.3N 107.4E	PCN 6			PGTW
45	252302	16.5N 107.2E	PCN 3	T1.0/1.0	INIT OBS EXP LLCC	RODN
46	260000	16.6N 107.2E	PCN 4		EXP LLCC	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	210025	8.4N 129.0E	1500FT		1009	15 230 80	130 16 070 30	10 10			+26 +25 +24 29	1

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON TIP
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
070912Z	11.4	127.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070918Z	12.4	125.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071000Z	12.8	123.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071006Z	13.3	121.6	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071012Z	13.6	120.2	30	13.9	119.6	35.	39.	5.	15.8	114.9	45.	53.	-20.	17.6	110.3	45.	133.	-10.	18.9	107.7	35.	204.	5.
071018Z	13.8	118.9	50	13.9	118.9	45.	6.	-5.	15.5	113.5	60.	91.	0.	17.3	109.2	45.	178.	-5.	19.3	106.9	35.	226.	10.
071100Z	14.4	117.7	60	14.3	117.6	60.	8.	0.	16.8	113.2	80.	40.	20.	18.3	108.6	65.	177.	30.	0.0	0.0	0.	-0.	0.
071106Z	15.1	116.7	60	15.1	116.5	60.	12.	0.	17.4	111.9	60.	75.	5.	18.7	107.9	50.	207.	20.	0.0	0.0	0.	-0.	0.
071112Z	15.6	115.8	65	15.6	115.9	65.	6.	0.	17.6	112.2	70.	29.	15.	19.0	109.2	50.	137.	20.	0.0	0.0	0.	-0.	0.
071118Z	16.2	114.9	60	16.3	114.8	65.	8.	5.	18.2	111.2	70.	51.	20.	19.7	108.1	50.	157.	25.	0.0	0.0	0.	-0.	0.
071200Z	16.8	113.9	60	16.7	114.0	60.	8.	0.	18.7	110.3	50.	80.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071206Z	17.3	113.2	55	17.3	113.2	60.	0.	5.	19.6	109.7	50.	92.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071212Z	17.9	112.6	55	18.3	112.1	55.	37.	0.	20.7	109.2	40.	84.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071218Z	18.6	112.0	50	18.7	112.0	45.	6.	-5.	21.9	111.3	25.	66.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071300Z	19.4	111.5	35	19.5	111.5	40.	6.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071306Z	20.2	111.2	30	20.2	111.0	35.	11.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071312Z	20.8	110.7	30	21.0	110.8	30.	13.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071318Z	21.3	110.3	25	21.3	110.3	25.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	12.	66.	165.	215.	10.	60.	163.	0.
AVG RIGHT ANGLE ERROR	8.	53.	160.	204.	6.	48.	156.	0.
AVG INTENSITY MAGNITUDE ERROR	3.	13.	18.	8.	3.	14.	15.	0.
AVG INTENSITY BIAS	1.	9.	13.	8.	1.	8.	5.	0.
NUMBER OF FORECASTS	14	10	6	2	10	7	3	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1206. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 12. KNOTS

TYPHOON TIP
FIX POSITIONS FOR CYCLONE NO. 2

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	080911	9.5N 132.4E	PCN 6			PGTW
2	081200	9.3N 131.9E	PCN 6			PGTW
3	082151	11.8N 130.0E	PCN 5			PGTW
4	090000	10.7N 129.5E	PCN 6			PGTW
5	090300	10.8N 129.2E	PCN 6	T0.0/0.0	INIT OBS	PGTW
6	090600	10.9N 129.1E	PCN 6			PGTW
7	090900	11.0N 128.3E	PCN 6		ULCC FIX	PGTW
8	091200	11.1N 127.6E	PCN 6		ULCC FIX	PGTW
9	091600	11.8N 126.2E	PCN 6	T1.5/1.5-	INIT OBS	PGTW
10	091800	12.3N 125.6E	PCN 6			PGTW
11	092100	12.5N 125.0E	PCN 6			PGTW
12	092130	12.8N 122.6E	PCN 5	T1.5/1.5	INIT OBS	RPMK
13	100000	12.9N 122.7E	PCN 4			PGTW
14	100300	12.9N 122.5E	PCN 4	T2.5/2.5+/D1.0/11HRS		PGTW
15	100600	13.3N 121.4E	PCN 4			PGTW
16	100900	13.1N 121.1E	PCN 6			PGTW
17	101010	13.4N 120.9E	PCN 3			PGTW
18	101200	13.5N 120.8E	PCN 4			PGTW
19	101600	13.8N 119.4E	PCN 6	T4.0/4.0 /D1.5/13HRS		PGTW
20	101800	13.8N 119.1E	PCN 6			PGTW
21	101942	13.7N 118.1E	PCN 6			RODN
22	102100	13.8N 118.3E	PCN 6			PGTW
23	102250	14.2N 118.0E	PCN 5	T3.0/3.0 /D1.5/25HRS		RPMK
24	102357	14.0N 117.6E	PCN 3	T3.5/3.5	INIT OBS	RODN
25	102357	14.4N 117.3E	PCN 3			RPMK
26	110000	14.6N 117.5E	PCN 4			PGTW
27	110300	14.8N 117.3E	PCN 4	T3.5/3.5-/D1.0/11HRS		PGTW
28	110644	15.4N 116.6E	PCN 3		EXP LLCC	PGTW
29	110900	15.5N 116.4E	PCN 4		EXP LLCC	PGTW
30	111056	15.6N 115.9E	PCN 4		EXP LLCC	PGTW

31	111600	16.1N	115.2E	PCN 4	T4.0/4.0-/S0.0/13HRS		PGTW
32	111800	16.5N	114.6E	PCN 6			PGTW
33	111929	16.0N	113.8E	PCN 5		ULCC FIX	RODN
34	112100	16.9N	114.2E	PCN 6			PGTW
35	112229	16.7N	114.4E	PCN 3	T3.0/3.5 /W0.5/23HRS		RPMK
36	112315	16.6N	114.0E	PCN 3	T4.0/4.0 /D0.5/24HRS	EXP LLCC	RODN
37	112335	16.0N	114.1E	PCN 3	T3.0/3.5 /W0.5/24HRS	EXP LLCC	RPMK
38	120000	16.0N	113.9E	PCN 4		EXP LLCC	PGTW
39	120300	17.3N	113.3E	PCN 4	T4.0/4.0-/S0.0/11HRS		PGTW
40	120600	17.2N	113.0E	PCN 6			PGTW
41	120632	17.6N	112.8E	PCN 3		EXP LLCC	PGTW
42	120632	18.0N	112.7E	PCN 3	T3.0/3.5 /S0.0/08HRS	EXP LLCC	RPMK
43	120900	17.9N	112.6E	PCN 4		EXP LLCC	PGTW
44	121200	18.2N	112.2E	PCN 4			PGTW
45	121209	17.3N	111.3E	PCN 5			RODN
46	121215	17.9N	112.3E	PCN 5			RPMK
47	121600	18.5N	112.1E	PCN 4	T2.5/3.5 /W1.5/13HRS	EXP LLCC	PGTW
48	121800	18.7N	112.1E	PCN 4		EXP LLCC	PGTW
49	121917	19.1N	111.5E	PCN 3		EXP LLCC	PGTW
50	122100	19.3N	111.8E	PCN 4		EXP LLCC	PGTW
51	122200	19.4N	111.5E	PCN 3	T2.5/3.0-/W0.5/24HRS	EXP LLCC	RPMK
52	130000	19.5N	111.5E	PCN 4		EXP LLCC	PGTW
53	130300	19.7N	111.4E	PCN 4	T1.5/2.5-	INIT OBS	PGTW
54	130600	20.0N	111.3E	PCN 4		EXP LLCC	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	110030	14.5N 117.7E	700MB	2977	984	70 090 25	170 69 110 30	10 5	CIRCULAR	20	+14 +17 + 9	2
2	110030	15.4N 116.4E	700MB	2930		60 030 74	120 70 020 21	5 5			+15 +17	3
3	111105	15.5N 116.1E	700MB	2921	977	70 090 4	080 54 360 30	5 5	CIRCULAR	30	+14 +20	3
4	112152	16.5N 114.2E	700MB	2934	981	50 020 30	130 65 020 20	15 5	CIRCULAR	20	+13 +10 +13	4
5	120044	17.0N 113.0E	700MB	2931		80 170 13	050 64 270 20	10 15			+14 +10 +11	4

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	110000	14.1N 117.5E	LAND				1000/ /////	EYE 70 PCT CIR OPEN NW	16.3N 120.6E	98321
2	110100	14.2N 117.2E	LAND				1091/ 52003	EYE 60 PCT CIR OPEN NW	16.3N 120.6E	98321
3	110200	14.4N 116.9E	LAND				1093/ 53012	EYE 60 PCT CIR OPEN N	16.3N 120.6E	98321
4	130350	19.9N 110.0E	LAND				2//// 53100		20.0N 110.3E	59758

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	101800	13.4N 110.5E	045	025	SHIP OBSERVATION PRESSURE EST. 995 MB
2	130900	20.6N 110.0E	030	030	WMO 59758
3	131500	21.0N 110.3E	025	030	WMO 59642

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON VERA
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		WIND	WARNING POSIT		WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND
070906Z	9.5	146.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070912Z	9.0	145.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070918Z	8.5	144.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071000Z	8.4	143.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071006Z	9.0	142.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071012Z	9.3	140.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071018Z	9.4	138.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071100Z	9.7	136.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071106Z	10.1	135.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071112Z	10.6	134.4	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071118Z	10.8	133.4	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071200Z	11.0	132.3	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071206Z	11.4	131.1	30	11.7	130.7	30.	30.	0.	13.1	127.1	40.	110.	-15.	14.4	123.1	55.	117.	-25.	16.9	119.8	55.	136.	-5.
071212Z	11.6	129.9	35	11.7	129.3	30.	36.	-5.	14.0	124.1	50.	223.	-10.	15.8	120.4	40.	230.	-40.	18.3	117.3	55.	202.	-5.
071218Z	11.4	129.2	40	12.0	128.4	40.	59.	0.	14.0	124.3	55.	163.	-10.	16.0	120.0	40.	180.	-35.	18.8	117.0	55.	168.	-10.
071300Z	11.3	128.6	50	11.2	128.5	45.	8.	-5.	12.6	124.0	55.	82.	-20.	13.9	119.3	50.	124.	-20.	15.0	114.5	55.	163.	-15.
071306Z	11.3	127.9	55	11.3	127.9	55.	0.	0.	12.8	123.2	65.	77.	-15.	14.3	119.7	55.	47.	-5.	16.3	116.7	60.	83.	-15.
071312Z	11.7	127.1	60	11.7	127.0	60.	6.	0.	13.1	122.5	55.	54.	-25.	15.2	118.6	60.	31.	0.	17.0	115.5	70.	70.	-10.
071318Z	12.1	126.3	65	12.2	126.0	65.	19.	0.	13.4	121.7	55.	42.	-20.	15.6	117.8	60.	30.	-5.	17.1	114.6	70.	104.	-15.
071400Z	12.5	125.4	75	12.4	125.4	70.	6.	-5.	13.6	121.5	55.	36.	-15.	15.1	117.8	65.	115.	-5.	17.3	115.3	75.	199.	-15.
071406Z	13.0	124.5	80	12.9	124.4	65.	8.	-15.	14.2	119.7	55.	51.	-5.	16.3	116.4	75.	71.	0.	18.4	113.7	65.	169.	-15.
071412Z	13.3	123.4	80	13.4	123.3	60.	8.	-20.	14.7	118.6	60.	51.	0.	17.1	115.3	70.	50.	-10.	18.9	112.7	60.	185.	-10.
071418Z	13.8	122.3	75	13.9	122.3	60.	6.	-15.	15.5	118.6	60.	59.	-5.	17.8	115.7	65.	136.	-20.	19.9	113.1	50.	277.	-15.
071500Z	14.2	121.4	70	14.3	121.1	60.	18.	-10.	16.7	116.9	70.	11.	0.	19.2	114.4	55.	120.	-35.	21.4	112.5	45.	309.	-10.
071506Z	14.7	120.4	60	14.8	120.1	55.	18.	-5.	17.0	116.5	75.	53.	0.	19.4	114.2	55.	181.	-25.	21.8	112.3	40.	370.	0.
071512Z	15.4	119.1	60	15.5	119.2	55.	8.	-5.	18.4	115.5	70.	63.	-10.	21.2	112.8	50.	196.	-20.	0.0	0.0	0.	-0.	0.
071518Z	16.1	117.8	65	16.3	117.7	60.	13.	-5.	18.8	114.0	60.	42.	-25.	21.9	111.9	50.	228.	-15.	0.0	0.0	0.	-0.	0.
071600Z	16.7	116.7	70	17.0	116.6	65.	19.	-5.	19.5	112.8	65.	41.	-25.	21.8	110.4	40.	198.	-15.	0.0	0.0	0.	-0.	0.
071606Z	17.2	115.6	75	17.3	115.4	70.	13.	-5.	19.9	111.2	60.	21.	-20.	22.6	108.2	35.	159.	-5.	0.0	0.0	0.	-0.	0.
071612Z	17.8	114.6	80	17.7	114.6	70.	6.	-10.	19.8	110.9	55.	74.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071618Z	18.4	113.4	85	18.6	113.2	80.	17.	-5.	20.9	109.0	65.	58.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071700Z	19.0	112.3	90	19.1	112.1	90.	13.	0.	21.7	108.0	65.	74.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071706Z	19.6	111.0	80	19.8	111.1	85.	13.	5.	21.8	107.6	60.	110.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071712Z	19.9	109.6	70	19.8	109.7	65.	8.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071718Z	20.3	108.2	65	20.3	108.5	65.	17.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071800Z	20.9	107.0	55	21.0	107.0	55.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071806Z	21.3	105.7	40	21.3	105.8	45.	6.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	14.	72.	131.	187.	14.	72.	131.	187.
AVG RIGHT ANGLE ERROR	9.	39.	66.	70.	9.	39.	66.	70.
AVG INTENSITY MAGNITUDE ERROR	5.	13.	16.	11.	5.	13.	16.	11.
AVG INTENSITY BIAS	-4.	-10.	-16.	-11.	-5.	-10.	-16.	-11.
NUMBER OF FORECASTS	25	21	17	13	24	21	17	13

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2546. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 12. KNOTS

TYPHOON VERA
FIX POSITIONS FOR CYCLONE NO. 3

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
	1	090600	9.6N 145.6E	PCN 6	T0.5/0.5	INIT OBS ULCC FIX	PGTW
*	2	090850	9.1N 144.1E	PCN 5			PGTW
*	3	092230	9.5N 142.5E	PCN 5		ULCC FIX	PGTW
*	4	100300	9.3N 141.4E	PCN 6	T1.5/1.5 /D1.0/21HRS	ULCC FIX	PGTW
	5	100600	9.1N 142.1E	PCN 4			PGTW
	6	100829	9.2N 141.5E	PCN 5			PGTW
	7	100936	9.1N 141.0E	PCN 6			PGTW
	8	101200	8.9N 140.0E	PCN 6			PGTW
	9	101600	9.4N 138.4E	PCN 6	T2.0/2.0 /D0.5/13HRS		PGTW
	10	101800	9.7N 137.6E	PCN 6			PGTW
	11	102109	10.2N 137.2E	PCN 5		ULCC FIX	PGTW

12	102109	10.0N 137.4E	PCN 5	T2.0/2.0	INIT OBS	RPMK
13	110000	10.3N 136.7E	PCN 6			PGTW
14	110300	9.0N 135.8E	PCN 4	T2.0/2.0 /D0.5/11HRS		PGTW
15	110644	9.5N 135.2E	PCN 6		ULCC FIX	PGTW
16	110949	9.7N 134.5E	PCN 6		ULCC FIX	PGTW
17	111056	10.7N 134.1E	PCN 6		ULCC FIX	PGTW
18	111600	10.5N 133.4E	PCN 6	T2.0/2.0-/S0.0/13HRS		PGTW
19	111747	10.4N 132.8E	PCN 6			PGTW
20	112048	11.6N 132.2E	PCN 6			PGTW
21	112335	10.8N 131.9E	PCN 5	T2.5/2.5 /D0.5/26HRS		RPMK
22	120000	11.0N 132.5E	PCN 6			PGTW
23	120300	11.6N 131.2E	PCN 6	T2.5/2.5 /D0.5/11HRS		PGTW
24	120600	11.8N 130.2E	PCN 6			PGTW
25	120632	11.9N 130.0E	PCN 5			PGTW
26	120632	11.6N 132.0E	PCN 5			RPMK
27	120928	11.7N 129.7E	PCN 6			PGTW
28	121200	11.5N 129.2E	PCN 6			PGTW
29	121600	11.6N 128.8E	PCN 6	T3.0/3.0 /D1.0/13HRS		PGTW
30	121800	11.3N 129.0E	PCN 6			PGTW
31	121917	11.5N 129.0E	PCN 6			PGTW
32	122100	11.5N 129.2E	PCN 6			PGTW
33	122313	10.9N 128.7E	PCN 5	T3.0/3.0 /D0.5/24HRS		RPMK
34	122314	11.5N 128.9E	PCN 6			PGTW
35	130000	11.1N 128.3E	PCN 4			PGTW
36	130300	11.2N 127.8E	PCN 4	T3.5/3.5 /D1.0/11HRS		PGTW
37	130620	11.4N 127.9E	PCN 3			PGTW
38	130907	11.5N 127.3E	PCN 3			PGTW
39	131200	11.2N 127.0E	PCN 2			PGTW
40	131600	12.1N 126.2E	PCN 2	T4.0/4.0-/D1.0/13HRS		PGTW
41	131800	12.2N 126.0E	PCN 4			PGTW
42	131905	12.0N 125.9E	PCN 5			PGTW
43	132100	12.1N 125.5E	PCN 5			PGTW
44	132147	12.4N 125.5E	PCN 5		ULCC FIX	PGTW
45	132251	12.0N 125.5E	PCN 5			PGTW
46	132351	12.4N 125.6E	PCN 5	T4.5/4.5-/D1.5/24HRS		RPMK
47	140000	12.4N 125.5E	PCN 2			PGTW
48	140300	12.8N 124.9E	PCN 2	T4.5/4.5-/D1.0/11HRS	EYE DIA 10NM	PGTW
49	140600	12.9N 124.4E	PCN 2			PGTW
50	140607	12.9N 124.4E	PCN 1	T4.5/4.5	INIT OBS	RODN
51	140900	13.1N 123.8E	PCN 4			PGTW
52	141027	13.2N 123.7E	PCN 4			PGTW
53	141131	13.1N 123.7E	PCN 1			RODN
54	141131	13.3N 123.6E	PCN 1			RPMK
55	141200	13.4N 123.2E	PCN 2			PGTW
56	141600	13.7N 122.7E	PCN 2	T4.5/4.5-/D0.5/13HRS		PGTW
57	141800	13.9N 122.3E	PCN 2			PGTW
58	141852	14.0N 122.2E	PCN 2			PGTW
59	142100	14.1N 121.8E	PCN 2			PGTW
60	142126	14.2N 121.6E	PCN 4			PGTW
61	142156	14.0N 121.5E	PCN 1	T4.0/4.5 /W0.5/22HRS		RPMK
62	150000	14.4N 121.1E	PCN 4			PGTW
63	150300	14.6N 120.8E	PCN 4	T3.5/4.5+/W1.0/11HRS		PGTW
64	150600	15.0N 120.4E	PCN 4			PGTW
65	151006	15.3N 119.7E	PCN 4			PGTW
66	151110	15.4N 119.2E	PCN 3			RODN
67	151110	15.5N 119.3E	PCN 4			PGTW
68	151600	16.0N 118.1E	PCN 4	T4.0/4.0 /D0.5/13HRS		PGTW
69	151800	16.2N 117.7E	PCN 4			PGTW
70	152100	16.4N 117.1E	PCN 4			PGTW
71	152349	16.8N 116.8E	PCN 3	T4.0/4.0+/S0.0/22HRS		RPMK
72	160000	17.0N 116.6E	PCN 4			PGTW
73	160300	16.9N 115.8E	PCN 2	T4.5/4.5 /D1.0/11HRS	EYE OPEN N	PGTW
74	160600	17.1N 115.3E	PCN 2			PGTW
75	160725	17.2N 115.3E	PCN 3	T4.5/4.5	INIT OBS	RODN
76	160900	17.7N 114.8E	PCN 4			PGTW
77	161200	17.9N 114.4E	PCN 4			PGTW
78	161600	18.5N 113.5E	PCN 6	T5.0/5.0-/D1.0/13HRS		PGTW
79	161800	18.6N 113.1E	PCN 6			PGTW
80	162100	18.6N 112.6E	PCN 6			PGTW
81	162225	18.5N 112.1E	PCN 3			RODN
82	162327	18.9N 112.5E	PCN 5	T4.5/4.5-/D0.5/24HRS		RPMK
83	170000	19.0N 112.1E	PCN 6		ULCC FIX	PGTW
84	170300	19.2N 111.6E	PCN 6	T4.0/4.5-/W1.0/11HRS		PGTW
85	170600	19.3N 111.0E	PCN 6			PGTW
86	170712	19.7N 110.7E	PCN 5	T4.0/4.5-/W0.5/08HRS		RPMK
87	170900	19.8N 110.5E	PCN 6			PGTW
88	171105	19.6N 109.5E	PCN 1			RODN
89	171105	20.1N 109.9E	PCN 4			RPMK
90	171200	19.8N 109.8E	PCN 6			PGTW
91	171207	19.8N 109.6E	PCN 2	T4.5/4.5		RODN
92	171600	20.1N 108.5E	PCN 6	T3.5/4.0-/W1.0/13HRS		PGTW
93	171800	20.3N 108.1E	PCN 4			PGTW
94	171957	20.5N 107.6E	PCN 3			RODN
95	172100	20.8N 107.3E	PCN 4			PGTW
96	172204	20.5N 107.0E	PCN 5			RODN
97	172204	20.7N 106.9E	PCN 5		ULCC FIX	RPMK
98	180000	21.6N 107.0E	PCN 6			PGTW
99	180300	21.3N 106.3E	PCN 6	T3.0/3.5-/W1.0/11HRS		PGTW
*100	180600	20.6N 104.8E	PCN 6			PGTW
*101	180659	20.5N 104.7E	PCN 5	T2.5/2.5		RODN
102	180900	21.0N 104.0E	PCN 6			PGTW

103	181200	20.0N 103.0E	PCN 6		ULCC FIX	PGTW
104	190300	22.5N 98.5E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	120116	11.1N 132.2E	1500FT		1004	30 040 90	120 32 030 160	6 15			+25 +24 +14	2
2	122207	11.1N 128.4E	1500FT		992	40 100 25	110 36 040 60	12 15			+12 +13 +12 29	3
3	130059	11.2N 128.5E	1500FT		993	45 140 45	190 51 130 60	5 8				3
4	130919	11.5N 127.7E	700MB	2966	986	50 290 35	040 52 300 52	15 15	CIRCULAR	30	+13 +13	4
5	131224	11.8N 126.9E	700MB	2954			130 69 030 52	15 10			+11 +13	4
6	150900	15.2N 119.8E	700MB	2959		35 230 90	010 55 200 45	4 8				5
7	151136	15.6N 118.8E	700MB	2970	986		190 65 130 95	10 6	ELLIPTICAL	20 10 360	+11 +14 +12	5
8	160056	17.3N 115.8E	700MB			75 010 30	100 73 010 30	15 10	CIRCULAR	40	+15 +16	8
9	161106	17.5N 114.8E	700MB			40 270 30	230 68 150 15	15 10	CIRCULAR	35	+16 +15	8
10	162200	18.9N 112.8E	700MB			70 070 60	100 90 110 50	20	CIRCULAR	40		9

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	131400	11.9N 126.8E	LAND				10303 40000	EYE 80 PCT CIR OPEN E	14.0N 124.3E	98447
2	131430	11.9N 126.8E	LAND				10513 42905	EYE 80 PCT CIR OPEN E	14.0N 124.3E	98447
3	131500	11.9N 126.8E	LAND				10513 40000	EYE 80 PCT CIR OPEN E	14.0N 124.3E	98447
4	131530	11.9N 126.7E	LAND				10512 40000	EYE 80 PCT CIR OPEN E	14.0N 124.3E	98447
5	131600	11.9N 126.8E	LAND				10513 40000	EYE 80 PCT CIR OPEN E	14.0N 124.3E	98447
6	131630	12.1N 126.7E	LAND				10422 42900	EYE 80 PCT CIR OPEN N	14.0N 124.3E	98447
7	131700	12.2N 126.5E	LAND				10422 43219	EYE 80 PCT CIR OPEN N	14.0N 124.3E	98447
8	131730	12.2N 126.3E	LAND				10412 42821	EYE 80 PCT CIR OPEN N	14.0N 124.3E	98447
9	131800	12.2N 126.2E	LAND				10513 42712	EYE 80 PCT CIR OPEN W	14.0N 124.3E	98447
10	131830	12.2N 126.1E	LAND				12653 42910	EYE 100 PT ELPTCL AXIS 60/30	14.0N 124.3E	98447
11	132330	12.4N 125.5E	LAND				10523 42915	EYE DIA 30 KMS	14.0N 124.3E	98447
12	140000	12.5N 125.4E	LAND				10523 43200	EYE 100 PCT CIR DIA 30 KMS	14.0N 124.3E	98447
13	140000	12.5N 124.4E	LAND				11901 /////		10.3N 124.0E	98646
14	140030	12.5N 125.4E	LAND				10512 43200	EYE DIA 30 KMS	14.0N 124.3E	98447
15	140100	12.4N 125.3E	LAND				10513 42710	EYE DIA 30 KMS	14.0N 124.3E	98447
16	140100	12.5N 125.2E	LAND				20040 52020		10.3N 124.0E	98646
17	140130	12.6N 125.2E	LAND				10512 43216	EYE DIA 30 KMS	14.0N 124.3E	98447
18	140200	12.6N 125.1E	LAND				10512 42711	EYE DIA 30 KMS	14.0N 124.3E	98447
19	140300	12.7N 124.8E	LAND				10512 42811	EYE DIA 25 KMS	14.0N 124.3E	98447
20	140300	12.8N 124.8E	LAND				3//// 42810	EYE IN BLIND SECTOR	10.3N 124.0E	98646
21	140310	12.7N 124.8E	LAND				10512 42909	EYE DIA 25 KMS	14.0N 124.3E	98447
22	140400	12.7N 124.7E	LAND				10512 42710	EYE DIA 25 KMS	14.0N 124.3E	98447
23	140430	12.8N 124.7E	LAND				10512 43216	EYE DIA 30 KMS	14.0N 124.3E	98447
24	140500	12.8N 124.6E	LAND				10512 43205	EYE DIA 30 KMS	14.0N 124.3E	98447
25	140600	12.9N 124.5E	LAND				10512 43213		14.0N 124.3E	98447
26	140830	13.2N 124.0E	LAND				10512 42915		14.0N 124.3E	98447
27	140830	13.2N 124.2E	LAND				2051/ 43204		14.1N 123.0E	98440
28	140900	13.4N 124.2E	LAND				2041/ 43411		14.1N 123.0E	98440
29	141000	13.4N 124.0E	LAND				1061/ 43205		14.1N 123.0E	98440
30	141030	13.2N 123.9E	LAND				1061/ 42211		14.1N 123.0E	98440
31	141030	13.2N 123.6E	LAND				10512 42611		14.0N 124.3E	98447
32	141100	13.3N 123.8E	LAND				1061/ 42907		14.1N 123.0E	98440
33	141110	13.3N 123.7E	LAND				1061/ 42705		14.1N 123.0E	98440
34	141110	13.4N 123.4E	LAND				10513 42917		14.0N 124.3E	98447
35	141200	13.3N 123.6E	LAND				1052/ 42707		14.1N 123.0E	98440
36	141230	13.3N 123.4E	LAND				1051/ /////		14.1N 123.0E	98440
37	141230	13.4N 123.3E	LAND				10513 42903		14.0N 124.3E	98447
38	141300	13.3N 123.3E	LAND				10510 42706		14.1N 123.0E	98440
39	141300	13.4N 123.2E	LAND				10513 42713	EYE DIA 25 KMS	14.0N 124.3E	98447
40	141330	13.4N 123.2E	LAND				10310 43207		14.1N 123.0E	98440
41	141400	13.3N 123.0E	LAND				10553 42715		14.0N 124.3E	98447
42	141400	13.5N 123.1E	LAND				10611 42905		14.1N 123.0E	98440
43	141430	13.4N 123.1E	LAND				10611 42904		14.1N 123.0E	98440
44	141600	13.5N 122.9E	LAND				1132/ 43205		14.1N 123.0E	98440
45	141630	13.6N 122.8E	LAND				1031/ 43005		14.1N 123.0E	98440
46	142200	14.1N 121.6E	LAND				10310 52712		14.1N 123.0E	98440
47	142200	14.0N 121.8E	LAND				4//// 52016		16.3N 120.6E	98321
48	142300	14.1N 121.5E	LAND				21320 52709		14.1N 123.0E	98440
49	142300	13.8N 122.2E	LAND				1074/ 52912	EYE 60 PCT CIR DIA 50 KMS	16.3N 120.6E	98321
50	150000	14.2N 121.3E	LAND				21340 52012		14.1N 123.0E	98440
51	150030	14.3N 121.1E	LAND				35/51 52913		14.1N 123.0E	98440
52	150130	14.8N 120.2E	LAND	POOR					15.2N 120.6E	98327
53	150200	14.7N 120.3E	LAND	GOOD					15.2N 120.6E	98327
54	150300	14.4N 120.7E	LAND				323// 531//		14.8N 120.2E	98426
55	150300	14.8N 120.7E	LAND	FAIR					15.2N 120.6E	98327
56	150330	14.5N 120.6E	LAND				2037/ 331//		14.8N 120.2E	98426
57	150400	14.5N 120.5E	LAND				3405/ 631//		14.8N 120.2E	98426
58	150400	14.6N 120.5E	LAND	POOR					15.2N 120.6E	98327
59	150430	14.6N 120.5E	LAND				3155/ 529//		14.8N 120.2E	98426
60	150500	14.3N 121.1E	LAND				35/51 52913		14.1N 123.0E	98440
61	150500	14.8N 120.3E	LAND	FAIR					15.2N 120.6E	98327

62	150600	14.8N 120.2E	LAND	FAIR			15.2N 120.6E	98327
63	150800	15.1N 120.1E	LAND			3434/ 733//	14.8N 120.2E	98426

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	170900	19.7N 110.5E	080	020	WMO 59758, 59855
2	171200	19.8N 109.7E	065	015	WMO 59845, 59758
3	180300	20.9N 106.4E	050	010	WMO 48826, 48820

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

SUPER TYPHOON WAYNE
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
072018Z	8.5	130.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072100Z	9.4	137.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072106Z	10.6	136.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072112Z	11.8	136.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072118Z	13.0	135.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072200Z	14.0	134.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072206Z	14.7	133.9	30	14.6	134.1	25.	13.	-5.	16.2	129.9	40.	96.	-25.	18.2	126.4	55.	205.	-80.	20.0	123.7	65.	371.	-15.
072212Z	15.4	132.8	40	15.2	132.6	30.	17.	-10.	17.3	129.2	40.	106.	-40.	19.4	126.7	55.	203.	-65.	21.5	124.7	65.	476.	20.
072218Z	16.1	131.6	50	16.1	131.8	45.	12.	-5.	18.4	128.7	65.	150.	-35.	20.4	126.1	75.	319.	-35.	22.4	124.0	80.	513.	50.
072300Z	16.8	130.2	55	16.8	130.2	50.	0.	-5.	19.9	125.8	70.	72.	-50.	22.9	122.7	80.	185.	-15.	0.0	0.0	0.	-0.	0.
072306Z	17.4	128.8	65	17.4	128.8	65.	0.	0.	20.4	124.3	85.	72.	-50.	23.5	121.1	70.	160.	-10.	0.0	0.0	0.	-0.	0.
072312Z	18.2	127.6	80	18.2	127.5	65.	6.	-15.	21.6	123.1	85.	102.	-35.	24.2	120.5	65.	204.	20.	0.0	0.0	0.	-0.	0.
072318Z	18.8	126.1	100	18.8	126.3	75.	11.	-25.	21.9	122.0	90.	91.	-20.	24.6	119.4	60.	229.	30.	0.0	0.0	0.	-0.	0.
072400Z	19.3	124.7	120	19.3	124.5	125.	11.	5.	21.8	118.9	115.	45.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072406Z	19.8	123.2	135	19.9	123.2	130.	6.	-5.	22.8	118.2	105.	42.	25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072412Z	20.4	121.0	120	20.5	121.2	120.	34.	0.	22.5	116.3	100.	135.	55.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072418Z	21.3	120.5	110	21.1	120.2	115.	21.	5.	23.4	115.2	90.	144.	60.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072500Z	22.4	119.4	95	22.3	119.3	95.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072506Z	23.5	118.2	80	23.5	118.1	85.	6.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072512Z	24.7	116.8	45	24.8	117.2	45.	23.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072518Z	25.0	115.4	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	12.	96.	226.	454.	12.	91.	226.	424.
AVG RIGHT ANGLE ERROR	10.	63.	92.	102.	10.	58.	92.	73.
AVG INTENSITY MAGNITUDE ERROR	6.	30.	36.	20.	6.	36.	30.	10.
AVG INTENSITY BIAS	-4.	-9.	-22.	10.	-4.	-16.	-31.	3.
NUMBER OF FORECASTS	14	11	7	3	13	10	6	2

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1739. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 14. KNOTS

SUPER TYPHOON WAYNE
FIX POSITIONS FOR CYCLONE NO. 4

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
*	1	210000	12.5N 130.5E	PCN 6	T1.0/1.0	INIT OBS	PGTW
	2	211600	12.6N 135.0E	PCN 6	T1.5/1.5 /D0.5/16HRS		PGTW
	3	211800	12.7N 135.1E	PCN 6			PGTW
	4	212040	13.0N 135.5E	PCN 5			PGTW
	5	220000	14.6N 135.2E	PCN 6	T2.0/2.0 /D1.0/08HRS	ULCC FIX	PGTW
	6	220600	15.0N 133.3E	PCN 6		ULCC FIX	PGTW
	7	220900	14.9N 132.8E	PCN 6		ULCC FIX	PGTW
	8	221200	15.5N 132.2E	PCN 6			PGTW
	9	221600	16.0N 132.0E	PCN 6	T3.5/3.5 /D2.0/16HRS		PGTW
	10	221800	16.4N 131.5E	PCN 6			PGTW
	11	221855	16.1N 131.5E	PCN 5			PGTW
	12	222100	16.3N 131.0E	PCN 6			PGTW
	13	222258	16.6N 130.5E	PCN 3	T3.5/3.5		RODN
	14	230000	16.9N 130.2E	PCN 4			PGTW
	15	230300	17.1N 129.3E	PCN 4	T4.0/4.0 /D2.0/11HRS		PGTW
	16	230600	17.4N 128.7E	PCN 4			PGTW
	17	230900	18.0N 128.2E	PCN 4			PGTW
	18	230956	17.6N 127.8E	PCN 3			RODN
	19	231137	18.2N 127.5E	PCN 3			RODN
	20	231200	18.4N 127.5E	PCN 4			PGTW
	21	231600	18.6N 126.6E	PCN 4	T4.5/4.5 /D1.0/13HRS		PGTW
	22	231800	18.9N 126.1E	PCN 4			PGTW
	23	231842	18.9N 126.1E	PCN 4			RODN
	24	231843	19.0N 125.7E	PCN 4			PGTW
	25	232100	19.0N 125.4E	PCN 2			PGTW
	26	232139	19.1N 125.1E	PCN 1			PGTW
	27	240000	19.3N 124.6E	PCN 2			PGTW
	28	240017	19.2N 124.8E	PCN 1	T5.0/5.0 /D1.5/25HRS		RODN
	29	240300	19.6N 123.8E	PCN 2	T6.5/6.5	INIT OBS	PGTW
	30	240600	19.9N 123.0E	PCN 2			PGTW
	31	240727	20.0N 122.6E	PCN 1	T5.5/5.5	INIT OBS	RODN

32	241019	20.3N 121.9E	PCN 3			PGTW
33	241116	20.0N 122.0E	PCN 6			RODN
34	241116	20.3N 122.0E	PCN 3			RPMK
35	241200	20.6N 121.7E	PCN 4			PGTW
36	241600	21.0N 120.8E	PCN 4	T6.0/6.0-/D1.5/13HRS		PGTW
37	241800	21.3N 120.4E	PCN 4			PGTW
38	242100	21.7N 119.9E	PCN 4			PGTW
39	242356	22.2N 119.1E	PCN 5			RODN
40	250000	22.4N 119.2E	PCN 4			PGTW
41	250300	23.0N 118.7E	PCN 2	T4.0/5.0-/W2.5/11HRS		PGTW
42	250600	23.6N 118.2E	PCN 4			PGTW
43	250715	24.0N 118.1E	PCN 3	T4.5/5.5-/W1.0/24HRS		RODN
44	250715	23.7N 118.1E	PCN 1	T4.0/4.0-	INIT OBS	RPMK
45	250900	24.3N 117.8E	PCN 4			PGTW
46	251054	24.6N 117.0E	PCN 6			PGTW
47	251054	24.2N 116.8E	PCN 5			RPMK
48	251200	24.5N 116.5E	PCN 6		ULCC FIX	PGTW
49	251600	25.5N 115.8E	PCN 6	T2.0/3.0-	INIT OBS ULCC FIX	PGTW
50	261200	30.0N 112.0E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	220457	14.5N 134.2E	1500FT		1005	25 360 45	060 24 360 45	16 8	ELLIPTICAL	12 8 180	+26 +23 28	1
2	222053	16.3N 131.2E	700MB	2985	988		210 57 130 29	10 3	ELLIPTICAL	20 15 180	+12 +16	2
3	222352	16.8N 130.1E	700MB	2994	989	50 090 9	130 56 020 20	15 3			+12 +15	2
4	230550	17.3N 128.8E	700MB	2939		80 030 15	150 77 020 20	10 2			+15 +15 +12	3
5	230840	17.6N 128.3E	700MB	2891	976	65 350 15	080 58 330 30	5 2	CIRCULAR	20	+15 +13 +12	3
6	231130	18.0N 127.7E	700MB	2830			280 63 190 35	10 3			+12 +15 +12	3
7	232030	19.0N 125.7E	700MB	2540		35 140 120	210 96 130 28	12 5			+12 +18 +13	5
8	232325	19.2N 124.6E	700MB	2412	921	130 080 7	150 112 080 20	8 2	ELLIPTICAL	18 10 030	+11 +20 +11	5
9	241050	20.3N 122.0E	700MB	2419	922		140 97 040 30	10 1	CIRCULAR	12	+11 +22 +20	6
10	241315	20.6N 121.5E	700MB	2522			050 100 050 30	5 2	CIRCULAR	50		6
11	242032	21.8N 120.0E	700MB	2633	946		130 84 050 4	3 1	CIRCULAR	25	+22 +16	8

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	240340	19.9N 123.5E	LAND				10412 43412	EYE DIA 20 KMS	16.3N 120.6E	98321
2	240400	19.9N 123.4E	LAND				10412 42708	EYE DIA 20 KMS	16.3N 120.6E	98321
3	242100	21.8N 119.8E	LAND				6//// 53113		25.1N 121.6E	46696
4	250400	23.0N 118.5E	LAND				6//// 53022		22.6N 120.3E	46744
5	250400	23.1N 118.2E	LAND				6//// 53012		23.6N 119.6E	46734
6	250500	23.2N 118.4E	LAND				6//// 53409		22.6N 120.3E	46744
7	250500	23.3N 118.1E	LAND				6//// 53114		23.6N 119.6E	46734

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	250900	24.4N 117.9E	060	020	WMO 59134
2	251200	24.8N 117.3E	050	020	WMO 58927

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

SUPER TYPHOON ABBY
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		WIND	WARNING POSIT		WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND
080500Z	9.1	140.7	30	9.2	140.8	30.	8.	0.	10.8	137.2	45.	101.	10.	12.2	133.5	65.	139.	0.	13.8	128.8	90.	261.	-40.
080506Z	9.3	140.5	30	9.5	140.1	40.	27.	10.	10.9	136.6	55.	89.	10.	12.4	132.8	65.	132.	-10.	14.8	128.8	90.	290.	-45.
080512Z	9.6	139.9	30	9.6	139.9	35.	0.	5.	10.6	137.4	45.	72.	-10.	11.9	134.4	65.	153.	-25.	13.6	130.8	85.	221.	-55.
080518Z	9.9	139.4	35	9.8	139.3	35.	8.	0.	10.9	136.6	50.	91.	-15.	12.4	133.3	70.	156.	-45.	14.2	129.7	90.	216.	-55.
080600Z	10.2	138.8	35	10.2	138.8	40.	0.	5.	12.2	135.7	60.	36.	-5.	14.2	132.1	80.	104.	-50.	16.1	128.5	95.	167.	-50.
080606Z	11.0	138.1	45	10.9	137.8	45.	19.	0.	12.9	134.4	60.	46.	-15.	14.8	131.2	80.	114.	-55.	16.8	127.5	95.	199.	-40.
080612Z	11.8	137.3	55	11.7	137.5	55.	13.	0.	14.5	134.5	75.	35.	-15.	16.7	131.1	90.	57.	-50.	18.8	127.5	100.	159.	-25.
080618Z	12.4	136.4	65	12.3	136.3	65.	8.	0.	14.4	133.1	90.	43.	-25.	16.5	129.7	110.	112.	-35.	18.4	126.1	125.	246.	5.
080700Z	12.8	135.8	65	12.8	135.8	70.	0.	5.	14.8	132.6	90.	61.	-40.	16.2	129.6	115.	118.	-30.	17.6	126.9	125.	221.	10.
080706Z	13.6	134.7	75	13.5	134.9	80.	13.	5.	15.3	131.7	95.	72.	-40.	16.9	128.8	120.	130.	-15.	18.8	126.6	125.	219.	5.
080712Z	14.4	133.9	90	14.3	134.0	90.	8.	0.	16.5	130.6	130.	88.	-10.	18.7	127.7	125.	148.	0.	21.1	125.4	120.	296.	5.
080718Z	15.0	133.5	115	15.0	133.5	100.	0.	-15.	17.2	130.4	135.	59.	-10.	19.7	127.5	130.	171.	10.	22.0	125.0	120.	320.	10.
080800Z	15.8	132.8	130	15.8	132.8	125.	0.	-5.	18.2	129.7	135.	67.	-10.	20.3	127.1	120.	198.	5.	22.7	124.8	110.	352.	0.
080806Z	16.3	132.4	135	16.6	132.3	130.	19.	-5.	19.2	129.7	130.	87.	-5.	21.5	127.2	110.	216.	-10.	23.9	124.7	95.	375.	-20.
080812Z	17.1	132.0	140	17.2	131.9	135.	8.	-5.	20.0	129.6	125.	87.	0.	22.8	127.2	110.	254.	-5.	25.5	124.7	95.	404.	-30.
080818Z	17.4	131.4	145	17.8	131.5	140.	25.	-5.	20.7	129.2	125.	127.	5.	23.5	126.6	110.	298.	0.	26.2	123.9	95.	445.	-25.
080900Z	17.8	130.8	145	17.8	130.9	135.	6.	-10.	19.7	129.4	115.	64.	0.	22.3	127.2	105.	220.	-5.	24.7	125.0	95.	340.	-25.
080906Z	18.1	130.7	135	18.1	130.7	130.	0.	-5.	19.7	129.4	110.	58.	-10.	21.9	127.5	100.	189.	-15.	24.0	125.5	95.	299.	-25.
080912Z	18.7	130.3	125	18.8	130.2	125.	8.	0.	20.5	128.8	110.	102.	-5.	22.2	127.4	100.	187.	-25.	24.2	125.3	95.	327.	-30.
080918Z	18.9	130.4	120	18.9	130.2	120.	11.	0.	20.6	129.0	110.	90.	0.	23.1	126.9	100.	215.	-20.	25.5	124.8	95.	378.	-25.
081000Z	19.2	130.4	115	19.1	130.2	120.	13.	5.	20.4	129.1	110.	91.	0.	22.2	127.6	100.	173.	-20.	24.2	126.0	90.	318.	-25.
081006Z	19.5	130.4	120	19.7	130.0	115.	26.	-5.	21.3	128.6	105.	123.	-10.	23.1	127.0	100.	210.	-20.	25.8	125.3	90.	375.	-20.
081012Z	19.9	130.5	115	19.9	130.5	115.	0.	0.	21.5	130.4	105.	18.	-20.	23.3	129.3	90.	105.	-35.	25.1	127.8	80.	304.	-30.
081018Z	20.1	130.5	110	20.0	130.4	115.	8.	5.	21.3	130.3	100.	45.	-20.	23.2	129.3	85.	128.	-35.	25.0	127.8	75.	331.	-30.
081100Z	20.6	130.7	110	20.6	130.5	110.	11.	0.	22.5	129.9	90.	44.	-30.	23.9	128.2	80.	201.	-35.	25.4	126.5	70.	374.	-35.
081106Z	21.2	130.8	115	21.3	130.6	120.	13.	5.	23.3	129.5	105.	76.	-15.	25.1	127.2	90.	272.	-20.	27.2	125.2	80.	443.	-20.
081112Z	21.6	130.7	125	21.6	130.6	125.	6.	0.	23.5	129.3	110.	105.	-15.	25.3	127.0	90.	304.	-20.	27.7	125.2	75.	441.	-25.
081118Z	22.0	130.6	120	22.0	130.4	120.	11.	0.	24.0	129.0	105.	137.	-15.	25.6	126.6	90.	347.	-15.	27.5	124.4	75.	484.	-20.
081200Z	22.5	130.7	120	22.6	130.5	120.	13.	0.	24.4	129.4	100.	132.	-15.	25.9	127.3	90.	326.	-15.	27.7	125.3	80.	442.	-10.
081206Z	22.9	130.8	120	23.0	130.6	115.	13.	-5.	24.9	129.7	95.	136.	-15.	26.3	127.3	90.	337.	-10.	27.8	125.0	80.	486.	-5.
081212Z	23.4	131.2	125	23.5	131.0	115.	13.	-10.	25.3	130.0	95.	141.	-15.	26.5	127.8	90.	312.	-10.	28.1	125.7	80.	460.	-5.
081218Z	23.9	131.5	120	23.8	131.1	110.	23.	-10.	25.5	130.8	95.	166.	-10.	26.8	127.8	90.	313.	-5.	28.3	125.7	80.	487.	0.
081300Z	24.6	131.8	115	24.6	131.7	110.	5.	-5.	27.6	131.3	90.	123.	-15.	30.3	129.7	80.	231.	-10.	33.1	128.5	70.	356.	-5.
081306Z	24.9	132.2	110	25.3	132.1	105.	25.	-5.	28.1	131.2	90.	134.	-10.	30.7	129.6	80.	253.	-5.	33.3	128.5	65.	380.	-5.
081312Z	25.4	132.6	110	25.5	132.4	100.	12.	-10.	27.8	132.4	90.	60.	-10.	30.4	131.4	80.	160.	-5.	33.1	130.3	60.	313.	-10.
081318Z	26.1	133.0	105	26.2	132.9	100.	8.	-5.	29.0	132.7	90.	69.	-5.	31.7	132.1	75.	172.	-5.	34.4	131.3	55.	285.	-15.
081400Z	26.6	133.3	105	26.7	133.2	105.	8.	0.	29.9	133.4	85.	85.	-5.	32.5	131.8	70.	188.	-5.	35.2	129.8	50.	371.	-10.
081406Z	27.2	133.5	100	27.3	133.4	100.	8.	0.	30.1	133.4	80.	70.	-5.	32.6	131.8	65.	209.	-5.	35.3	129.8	45.	407.	-10.
081412Z	27.6	133.5	100	27.6	133.5	95.	0.	-5.	30.0	133.4	80.	56.	-5.	32.2	132.1	65.	225.	-5.	35.0	130.0	45.	462.	0.
081418Z	28.1	133.5	95	28.2	133.5	90.	6.	-5.	31.0	132.9	80.	115.	0.	38.0	131.2	55.	378.	-15.	0.0	0.0	0.	-0.	0.
081500Z	28.5	133.6	90	28.5	133.5	90.	5.	0.	32.5	132.3	75.	166.	0.	41.8	132.7	45.	483.	-15.	0.0	0.0	0.	-0.	0.
081506Z	29.1	134.1	85	29.0	133.7	85.	22.	0.	33.3	132.9	65.	172.	-5.	43.1	133.9	35.	518.	-20.	0.0	0.0	0.	-0.	0.
081512Z	29.5	134.3	85	29.6	134.3	85.	6.	0.	35.7	132.9	55.	254.	-15.	42.6	134.6	35.	476.	-10.	0.0	0.0	0.	-0.	0.
081518Z	30.0	134.8	80	30.2	134.7	80.	13.	0.	36.3	132.8	45.	255.	-25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081600Z	31.1	135.1	75	31.0	135.0	75.	8.	0.	38.0	135.7	50.	218.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081606Z	31.8	135.8	70	31.9	135.8	70.	6.	0.	39.3	139.7	45.	263.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081612Z	32.7	136.5	70	32.6	136.4	70.	8.	0.	37.9	139.2	40.	138.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081618Z	33.8	137.0	70	33.7	137.2	70.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081700Z	34.6	137.3	60	34.6	137.4	60.	5.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081706Z	35.1	138.1	55	35.0	138.2	55.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081712Z	35.6	139.4	45	36.0	140.1	40.	42.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	11.	104.	224.	340.	10.	104.	224.	340.
AVG RIGHT ANGLE ERROR	8.	84.	199.	307.	8.	84.	199.	307.
AVG INTENSITY MAGNITUDE ERROR	3.	12.	17.	21.	3.	12.	17.	21.
AVG INTENSITY BIAS	-1.	-11.	-17.	-19.	-2.	-11.	-17.	-19.
NUMBER OF FORECASTS	51	47	43	39	48	47	43	39

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2031. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 7. KNOTS

SUPER TYPHOON ABBY
FIX POSITIONS FOR CYCLONE NO. 5

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	012011	7.7N 146.7E	PCN 5	T0.0/0.0	INIT OBS	PGTW

2	020000	7.4N	146.0E	PCN 6			PGTW
3	020300	7.1N	145.8E	PCN 6			PGTW
4	020600	6.6N	145.7E	PCN 6			PGTW
5	020900	6.9N	145.7E	PCN 6			PGTW
6	030300	8.4N	145.4E	PCN 6	T1.0/1.0 /D1.0/30HRS		PGTW
7	030600	8.6N	145.1E	PCN 6			PGTW
8	031200	8.7N	144.5E	PCN 6		ULCC FIX	PGTW
9	032110	8.4N	143.7E	PCN 6			PGTW
10	040000	8.5N	143.1E	PCN 6			PGTW
11	040300	9.1N	143.2E	PCN 6	T2.0/2.0 /D1.0/24HRS		PGTW
12	040512	8.2N	142.8E	PCN 6			PGTW
13	040809	8.8N	142.5E	PCN 6		ULCC FIX	PGTW
14	041200	8.6N	142.3E	PCN 6			PGTW
15	041756	8.9N	141.7E	PCN 5			PGTW
16	042137	9.3N	141.2E	PCN 5			PGTW
17	050000	9.5N	140.7E	PCN 6			PGTW
18	050300	9.5N	140.3E	PCN 6	T3.0/3.0 /D1.0/24HRS		PGTW
19	050459	9.6N	140.3E	PCN 6	T2.5/2.5	INIT OBS	RODN
20	050600	9.7N	140.1E	PCN 6			PGTW
21	050900	9.0N	140.5E	PCN 6			PGTW
22	050929	9.1N	141.0E	PCN 5		ULCC FIX	PGTW
23	051017	9.3N	140.3E	PCN 6			PGTW
24	051200	10.0N	140.0E	PCN 6			PGTW
25	051600	10.1N	140.1E	PCN 6	T3.0/3.0	INIT OBS	PGTW
26	051744	10.3N	140.2E	PCN 6			PGTW
27	052028	9.9N	139.5E	PCN 3			PGTW
28	052257	10.2N	139.8E	PCN 5	T2.5/2.5	INIT OBS	RPMK
29	052257	10.1N	139.3E	PCN 5			PGTW
30	052257	10.1N	139.7E	PCN 5			RODN
31	060000	10.3N	138.6E	PCN 4			PGTW
32	060300	10.5N	138.2E	PCN 4	T3.0/3.0 /S0.0/24HRS		PGTW
33	060629	11.0N	137.9E	PCN 5		ULCC FIX	PGTW
34	060629	10.9N	137.8E	PCN 3	T3.0/3.0	INIT OBS	RPMK
35	060629	11.1N	138.2E	PCN 5	T3.5/3.5 /D1.0/24HRS		RODN
36	060908	11.6N	137.4E	PCN 4	T3.0/3.0 /D0.5/10HRS		RPMK
37	060900	11.4N	137.6E	PCN 6			PGTW
38	060955	11.4N	137.9E	PCN 5			RODN
39	061200	11.9N	137.1E	PCN 6			PGTW
40	061600	12.0N	136.4E	PCN 6	T4.0/4.0 /D1.0/13HRS		PGTW
41	061800	12.2N	136.1E	PCN 6			PGTW
42	062100	12.4N	135.7E	PCN 2			PGTW
43	062235	12.4N	135.6E	PCN 2			PGTW
44	062235	13.0N	136.1E	PCN 3	T4.0/4.0 /D1.5/24HRS		RPMK
45	062235	13.0N	136.1E	PCN 3			RODN
46	070000	12.9N	135.4E	PCN 4			PGTW
47	070300	13.4N	134.9E	PCN 2	T4.5/4.5 /D1.5/11HRS		PGTW
48	070617	13.6N	134.5E	PCN 3			PGTW
49	070617	13.5N	134.6E	PCN 3	T5.0/5.0 /D1.5/24HRS		RODN
50	070847	13.8N	134.3E	PCN 4			PGTW
51	070933	14.0N	133.9E	PCN 3			RODN
52	071200	14.3N	134.2E	PCN 2			PGTW
53	071600	14.8N	133.8E	PCN 2			PGTW
54	071800	15.0N	133.6E	PCN 2	T6.0/6.0 /D1.5/15HRS		PGTW
55	071901	15.2N	133.4E	PCN 1			PGTW
56	072100	15.3N	133.0E	PCN 2			PGTW
57	072127	15.3N	133.2E	PCN 1		EYE DIA 6NM	PGTW
58	072213	15.4N	133.0E	PCN 1			PGTW
59	072213	15.5N	133.0E	PCN 1			RODN
60	080000	15.6N	133.0E	PCN 2			PGTW
61	080300	15.9N	132.7E	PCN 2	T6.0/6.0-/D1.5/09HRS		PGTW
62	080600	16.5N	132.5E	PCN 2			PGTW
63	080604	16.4N	132.4E	PCN 1			PGTW
64	080604	16.3N	132.1E	PCN 3	T5.0/5.0	INIT OBS	RKSO
65	080654	16.5N	132.4E	PCN 1	T6.5/6.5 /D1.5/24HRS	EYE DIA 15NM	RODN
66	080900	16.8N	132.2E	PCN 2		EYE DIA 10NM	PGTW
67	081007	16.9N	132.2E	PCN 1			PGTW
68	081053	17.0N	132.1E	PCN 1		EYE DIA 12NM	PGTW
69	081200	17.1N	132.0E	PCN 2			PGTW
70	081600	17.5N	131.5E	PCN 2	T7.0/7.0-/D1.0/22HRS		PGTW
71	081800	17.6N	131.3E	PCN 2			PGTW
72	081849	17.4N	131.4E	PCN 1			PGTW
73	082106	17.6N	131.1E	PCN 2			PGTW
74	082106	17.5N	130.8E	PCN 1	T7.0/7.0-/D3.0/26HRS		RPMK
75	082106	17.5N	131.1E	PCN 1			RODN
76	082312	17.7N	131.1E	PCN 1		EYE DIA 20NM	RODN
77	082333	17.7N	130.8E	PCN 1			PGTW
78	090000	17.7N	131.0E	PCN 2			PGTW
79	090300	17.9N	130.9E	PCN 2	T7.0/7.0-/D1.0/11HRS	EYE DIA 10NM	PGTW
80	090552	18.0N	130.5E	PCN 3	T7.0/7.0 /D2.0/24HRS		RKSO
81	090552	18.1N	130.7E	PCN 1			PGTW
82	090552	18.1N	130.7E	PCN 1	T7.5/7.5-/D1.0/24HRS	EYE DIA 10NM	RODN
83	090600	18.1N	130.7E	PCN 2		EYE DIA 20NM	PGTW
84	090900	18.3N	130.6E	PCN 2		EYE DIA 20NM	PGTW
85	090946	18.4N	130.7E	PCN 1		EYE DIA 10NM	PGTW
86	091031	18.5N	130.5E	PCN 1		EYE DIA 10NM	PGTW
87	091200	18.7N	130.5E	PCN 2			PGTW
88	091600	18.8N	130.5E	PCN 2	T6.5/6.5 /W0.5/13HRS		PGTW
89	091800	18.8N	130.4E	PCN 2			PGTW
90	092045	18.9N	130.2E	PCN 1			PGTW
91	092311	19.2N	130.1E	PCN 1	T5.5/6.5 /W1.5/26HRS		RPMK
92	092311	19.1N	130.4E	PCN 1			RODN

93	100000	18.9N	130.4E	PCN 2			PGTW
94	100300	19.2N	130.4E	PCN 2			PGTW
95	100533	19.2N	130.2E	PCN 1	T7.0/7.5 /W0.5/24HRS		RODN
96	100539	19.7N	130.3E	PCN 1	T5.5/6.5 /W1.5/14HRS	EYE DIA 20NM	PGTW
97	100539	19.4N	130.0E	PCN 1	T6.0/7.0 /W1.0/24HRS	ULCC FIX	RKSO
98	100900	19.7N	130.4E	PCN 2			PGTW
99	101200	19.8N	130.4E	PCN 2			PGTW
100	101600	19.9N	130.4E	PCN 2	T5.0/6.0 /W1.5/10HRS		PGTW
101	101800	20.0N	130.4E	PCN 2			PGTW
102	101824	20.1N	130.4E	PCN 2			PGTW
103	102024	20.0N	130.3E	PCN 2			PGTW
104	102249	20.2N	130.4E	PCN 1			RODN
105	110000	20.3N	130.7E	PCN 2			PGTW
106	110300	20.9N	130.8E	PCN 2	T4.5/5.5 /W1.0/11HRS		PGTW
107	110527	21.1N	131.0E	PCN 1	T6.0/6.0 /S0.0/23HRS		RKSO
108	110527	21.4N	130.6E	PCN 2		EYE DIA 30NM	PGTW
109	110527	21.8N	130.7E	PCN 1	T5.5/7.0 /W1.5/24HRS		RODN
110	110904	21.4N	130.5E	PCN 2		EYE DIA 30NM	PGTW
111	111045	21.4N	130.8E	PCN 2			RPMK
112	111045	21.0N	131.0E	PCN 1			RODN
113	111200	21.6N	130.6E	PCN 2			PGTW
114	111600	21.7N	130.6E	PCN 2	T4.5/5.5 /W0.5/13HRS		PGTW
115	111751	21.8N	130.4E	PCN 2			PGTW
116	112141	22.3N	131.1E	PCN 1	T6.5/6.5	INIT OBS	RPMK
117	112144	22.3N	130.9E	PCN 1		EYE DIA 30NM	PGTW
118	112227	22.3N	130.7E	PCN 1			PGTW
119	120000	22.4N	130.8E	PCN 2		EYE DIA 30NM	PGTW
120	120300	22.6N	130.9E	PCN 2	T5.5/5.5-/D1.0/11HRS	EYE DIA 30NM	PGTW
121	120600	22.9N	130.8E	PCN 2		EYE DIA 40NM	PGTW
122	120657	22.9N	130.9E	PCN 1	T6.0/6.0	INIT OBS	RPMK
123	120900	23.2N	131.0E	PCN 2			PGTW
124	121024	23.1N	131.2E	PCN 1			RKSO
125	121200	23.4N	131.1E	PCN 2			PGTW
126	121800	23.7N	131.1E	PCN 2	T5.5/5.5-/S0.0/13HRS		PGTW
127	121941	24.0N	131.2E	PCN 1			RPMK
128	122100	24.2N	131.6E	PCN 2			PGTW
129	122123	24.2N	131.6E	PCN 1			PGTW
130	122123	24.3N	131.8E	PCN 1	T5.5/5.5	EYE DIA 24NM	RODN
131	122347	24.5N	131.9E	PCN 1		EYE DIA 30NM	PGTW
132	130300	24.7N	131.9E	PCN 2		EYE DIA 30NM	PGTW
133	130502	24.9N	132.1E	PCN 2	T5.5/5.5 /S0.0/11HRS		PGTW
134	130900	25.4N	132.3E	PCN 2			PGTW
135	131045	25.3N	132.8E	PCN 1			RPMK
136	131200	25.6N	132.4E	PCN 2			PGTW
137	131600	26.0N	132.6E	PCN 2	T5.5/5.5-/S0.0/13HRS		PGTW
138	131800	26.2N	132.9E	PCN 2			PGTW
139	132100	26.7N	133.1E	PCN 2			PGTW
140	132102	26.4N	133.1E	PCN 1	T5.5/5.5-/S0.0/24HRS		RODN
141	132325	26.5N	133.3E	PCN 1			PGTW
142	140300	26.9N	133.5E	PCN 2			PGTW
143	140600	27.3N	133.4E	PCN 2	T4.5/5.5-/W1.0/14HRS		PGTW
144	140900	27.5N	133.5E	PCN 2			PGTW
145	140942	27.3N	133.5E	PCN 1	T6.0/6.0 /S0.0/24HRS		RKSO
146	141200	27.8N	133.5E	PCN 2			PGTW
147	141600	28.1N	133.5E	PCN 2	T4.5/5.5-/W1.0/10HRS		PGTW
148	141800	28.2N	133.6E	PCN 2			PGTW
149	142041	28.4N	133.3E	PCN 3			PGTW
150	142303	28.3N	133.6E	PCN 1	T4.5/6.0-/W1.5/13HRS		RKSO
151	142303	28.3N	133.5E	PCN 1-			PGTW
152	150000	28.6N	133.4E	PCN 2			PGTW
153	150300	28.9N	133.6E	PCN 2			PGTW
154	150600	29.0N	133.8E	PCN 2			PGTW
155	150620	28.7N	133.9E	PCN 3	T4.5/4.5-/S0.0/14HRS		PGTW
156	150620	28.7N	133.7E	PCN 1	T5.0/5.5 /W0.5/24HRS		RODN
157	150900	29.3N	134.0E	PCN 4			PGTW
158	151001	28.8N	133.7E	PCN 2			RKSO
159	151200	29.5N	134.2E	PCN 4			PGTW
160	151600	29.7N	134.6E	PCN 4	T4.5/4.5-/S0.0/10HRS		PGTW
161	151800	29.9N	134.8E	PCN 4			PGTW
162	151904	30.2N	135.0E	PCN 3			PGTW
163	152020	30.6N	134.8E	PCN 1			PGTW
164	152241	30.7N	135.0E	PCN 3		EXP LLCC	RODN
165	152242	31.0N	135.2E	PCN 3			PGTW
166	160000	31.0N	135.1E	PCN 3			PGTW
167	160300	31.4N	135.6E	PCN 3			PGTW
168	160600	31.9N	135.8E	PCN 6			PGTW
169	160607	31.8N	135.6E	PCN 6	T3.5/4.5-/W1.0/14HRS		PGTW
170	160900	32.3N	136.6E	PCN 6		ULCC FIX	PGTW
171	161200	32.8N	136.5E	PCN 6			PGTW
172	161600	33.2N	136.9E	PCN 4	T3.0/4.0 /W0.5/10HRS		PGTW
173	161800	33.7N	137.5E	PCN 4			PGTW
174	161959	34.1N	137.4E	PCN 4			PGTW
175	162100	34.2N	137.2E	PCN 6			PGTW
176	170000	34.5N	137.5E	PCN 4			PGTW
177	170300	34.7N	137.7E	PCN 4			PGTW
178	170600	34.9N	138.1E	PCN 6	T2.5/3.5 /W1.0/14HRS	ULCC FIX	PGTW
179	170839	35.4N	138.6E	PCN 6		ULCC FIX	PGTW
180	170910	35.0N	138.7E	PCN 3		ULCC FIX	RKSO
181	171200	35.6N	139.3E	PCN 6		ULCC FIX	PGTW
182	171600	35.5N	139.8E	PCN 6		ULCC FIX	PGTW
183	171800	35.8N	140.5E	PCN 6		ULCC FIX	PGTW

184	172100	36.1N 141.2E	PCN 6		ULCC FIX	PGTW
185	172339	36.6N 142.7E	PCN 5	T2.0/2.0	INIT OBS	RKSO
186	180000	36.7N 141.7E	PCN 6	T1.5/2.5 /W1.0/18HRS		PGTW
187	180300	37.8N 141.6E	PCN 6			PGTW
188	180600	38.9N 141.5E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	050034	9.2N 140.7E	1500FT		1004	30 340 15	070 30 340 19	5 3				2
2	050840	9.4N 140.4E	700MB	3074	998	20 350 35	080 40 360 70				+23 +23 27	3
3	051147	9.6N 140.0E	1500FT		1002		230 26 130 90	7 10			+11 +11 + 9	3
4	052054	10.0N 139.2E	700MB	3043	997	30 340 60	060 30 340 120	10 10			+11 +11 +11	4
5	052336	10.2N 138.8E	700MB	3040	996	40 130 45	200 42 130 45	10 10			+12 +11 +10	4
6	060932	11.5N 137.8E	700MB	2980		25 240 70	260 34 200 30	15 3				5
7	061132	11.8N 137.5E	700MB	2965	985		150 72 050 25	10 2	CIRCULAR	30	+14 +15	5
8	062020	12.6N 136.2E	700MB	2880		20 310 120	140 75 070 8	7 7				6
9	062314	12.8N 135.9E	700MB	2877	973	80 130 10	250 79 360 1	5 5	CIRCULAR	20	+13 +22 + 5	6
10	070845	13.9N 134.5E	700MB	2747		80 240 20	160 95 060 12	10 2	CIRCULAR	20	+12 +21 + 9	7
11	071141	14.2N 134.1E	700MB	2653	946		080 110 310 14	12 2	ELLIPTICAL	20 14 360	+19 +21 +10	7
12	072037	15.3N 133.1E	700MB	2309		50 220 40	140 120 040 10	5 1				8
13	072329	15.7N 132.8E	700MB	2304	908	120 240 6	200 110 110 15	10 2	CIRCULAR	13	+15 +26 + 4	8
14	080835	16.7N 132.2E	700MB	2224	900	80 150 12	110 117 050 10	5 5			+12 +25 +10	10
15	081112	17.0N 132.1E	700MB	2208	901		310 105 240 10	10 5	CIRCULAR	20	+12 +22 +21	10
16	082049	17.6N 131.2E	700MB	2094	888		330 113 270 26	10 1	CIRCULAR	15	+33 +16	11
17	082342	17.8N 130.8E	700MB	2129	893	100 070 22	130 113 070 15	7 1	CIRCULAR	10	+13 +22 +13	11
18	091034	18.8N 130.1E	700MB	2267	908	130 250 90	210 108 120 30	7 2	ELLIPTICAL	10 7 180	+15 +18 +14	13
19	091337	18.8N 130.3E	700MB	2381			070 112 190 10					13
20	092120	19.0N 130.4E	700MB	2446	927	76 110 90	340 111 250 5	5 5			+14 +17 +17	14
21	092344	19.2N 130.3E	700MB	2453	927	100 050 10	010 107 290 5	5 5	CIRCULAR	20	+13 +17 +16	14
22	100857	19.7N 130.4E	700MB	2415		70 110 80	310 103 220 15	7 4				17
23	101109	19.8N 130.5E	700MB	2434	926		350 93 270 8	10 3	CIRCULAR	7	+14 +16	17
24	102109	20.3N 130.5E	700MB	2472	929	90 030 10	330 102 240 20	3 3			+14 +17 +16	18
25	110011	20.6N 130.8E	700MB	2500	934	70 340 10	210 106 120 33	4 3	CIRCULAR	30	+16 +17 +16	18
26	110834	21.5N 130.7E	700MB	2401	921	95 310 6	210 108 100 25	5 5			+14 +20 +14	19
27	111101	21.5N 130.7E	700MB	2369	917		080 110 050 15	5 5	CIRCULAR	25	+14 +21 +14	19
28	112332	22.5N 130.6E	700MB	2402	921	90 250 10	340 107 250 18	7 1	CIRCULAR	25	+14 +20	20
29	120209	22.7N 130.7E	700MB	2393		80 060 15	050 108 300 13	7 1	CIRCULAR	25	+15 +20	20
30	121117	23.3N 131.1E	700MB	2345			320 90 230 15	15 2	CIRCULAR	25	+15 +22 +17	22
31	121330	23.3N 131.2E	700MB	2357			120 92 030 20	10 2				22
32	122240	24.4N 131.7E	700MB	2411	922	65 360 12	240 89 330 45	10 7	CIRCULAR	25	+15 +17 +15	25
33	130102	24.7N 131.8E	700MB	2424		80 240 18	360 80 270 53	10 5	CIRCULAR	25	+16 +18 +16	25
34	131225	25.4N 132.7E	700MB	2471	928		330 94 250 50	10 2	CIRCULAR	20	+17 +18 +15	26
35	132046	26.3N 133.2E	700MB	2550	937	60 070 120	260 85 180 30	12 3	CIRCULAR	20	+16 +17 +16	27
36	141035	27.4N 133.5E	700MB	2593	942		230 74 120 30	5 10	CONCENTRIC	05 20	+17 +18 +15	28
37	141310	27.7N 133.5E	700MB	2609	944		100 63 120 120	5 10	CONCENTRIC	08 20	+15 +17 +15	28
38	142034	28.2N 133.5E	700MB	2681			320 66 230 90	15 4			+17 +18 +15	29
39	142319	28.4N 133.5E	700MB	2695	953	55 120 120	220 79 120 94	10 4			+17 +18 +17	29
40	150830	29.2N 134.2E	700MB	2964		45 010 190	010 62 270 90	10 5	CIRCULAR	40		30
41	151049	29.4N 134.2E	700MB	2703			190 86 090 100	10 5			+15 +17	30
42	152032	30.8N 134.8E	700MB	2772		60 290 120	100 67 030 118	10 5			+16 +17	31
43	152352	31.0N 135.0E	700MB	2795	965	65 200 155	230 81 140 120	5 4			+15 +17	31
44	160057	32.3N 136.1E	700MB	2828	969	35 250 40	150 60 080 174	5 8			+16 +16	32
45	161147	32.7N 136.4E	700MB	2840			230 69 170 144	5 1			+17 +16	32
46	162058	34.3N 137.2E	700MB	2801		75 150 90	220 73 150 77	5 6	CIRCULAR	20	+17 +16 +15	33
47	162254	34.5N 137.2E	700MB	2816		50 150 90	220 61 160 110	2 3	CIRCULAR	10	+14 +16 +15	33

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	160000	31.3N 135.3E	LAND				5//// /////		33.3N 134.2E	47899
2	160100	31.4N 135.5E	LAND				5//// 50614		33.3N 134.2E	47899
3	160300	31.8N 136.0E	LAND				5//// /////		33.3N 134.2E	47899
4	160400	31.7N 135.8E	LAND				5//// /////		33.3N 134.2E	47899
5	160500	31.8N 135.8E	LAND				5//// 50105		33.3N 134.2E	47899
6	160600	31.8N 135.8E	LAND				5//// 50105		33.3N 134.2E	47899
7	161400	33.2N 136.8E	LAND				5//// 50322		33.3N 134.2E	47899
8	161400	33.1N 136.9E	LAND				6//// 5////		34.6N 135.7E	47773
9	161500	33.4N 136.9E	LAND				5//// 50216		33.3N 134.2E	47899
10	161500	33.3N 137.0E	LAND				6//// 5////		34.6N 135.7E	47773
11	161900	34.0N 137.2E	LAND				203/2 50511		35.2N 137.0E	47636
12	161900	33.9N 137.1E	LAND				5///4 53511		35.3N 138.7E	47639
13	161900	34.3N 137.1E	LAND				65/// 53611		34.6N 135.7E	47773
14	162200	34.4N 137.3E	LAND				23711 50400		35.2N 137.0E	47636
15	162200	34.4N 137.1E	LAND				5///2 53600		35.3N 138.7E	47639
16	162200	34.4N 137.4E	LAND				65/// 5////		34.6N 135.7E	47773
17	162300	34.5N 137.2E	LAND				5///2 50211		35.3N 138.7E	47639
18	162300	34.5N 137.5E	LAND				55/// 50300		34.6N 135.7E	47773
19	162300	34.5N 137.3E	LAND				23711 53605		35.2N 137.0E	47636
20	170000	34.5N 137.2E	LAND				52//3 50400		35.3N 138.7E	47639
21	170000	34.6N 137.5E	LAND				55/// 53600		34.6N 135.7E	47773

22	170100	34.5N 137.3E	LAND				52/13 50000	35.3N 138.7E	47639
23	170100	34.9N 137.5E	LAND				55/// 53511	34.6N 135.7E	47773
24	170200	34.8N 137.3E	LAND				51/13 50111	35.3N 138.7E	47639
25	170400	34.9N 137.5E	LAND				52/13 50411	35.3N 138.7E	47639
26	170500	34.9N 138.0E	LAND				353// /////	35.2N 137.0E	47636
27	170500	34.9N 137.9E	LAND				52/43 50919	35.3N 138.7E	47639
28	170500	34.8N 138.1E	LAND				55/// 5////	34.6N 135.7E	47773
29	170600	35.0N 138.3E	LAND				5//// /////	35.2N 137.0E	47636
30	170600	35.0N 138.2E	LAND				51//3 50814	35.3N 138.7E	47639
31	170600	35.0N 138.3E	LAND				55//1 50611	34.6N 135.7E	47773
32	170700	35.1N 138.5E	LAND				5//// /////	35.2N 137.0E	47636
33	170700	35.1N 138.4E	LAND				21//3 50511	35.3N 138.7E	47639
34	170700	35.1N 138.4E	LAND				55//1 50611	34.6N 135.7E	47773
35	170800	35.2N 138.6E	LAND				7//// /////	35.2N 137.0E	47636
36	170800	35.2N 138.6E	LAND				5///3 50716	35.3N 138.7E	47639
37	170800	35.1N 138.6E	LAND				55//1 50611	34.6N 135.7E	47773
38	170900	35.2N 138.7E	LAND				4///3 50705	35.3N 138.7E	47639
39	170945	35.5N 139.2E	LAND	GOOD	CIRCULAR	60		35.7N 139.3E	47642

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	170000	34.6N 137.4E	060	030	WMO 47654
2	170900	35.4N 138.3E	050	018	WMO 47638
3	171200	35.7N 139.5E	045	020	WMO 47626
4	171500	36.4N 139.6E	040	020	WMO 47624
5	171800	36.6N 140.3E	040	025	WMO 47629
6	180000	37.5N 140.6E	035	030	WMO 47595

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM BEN
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
081200Z	24.3	145.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081206Z	24.9	145.8	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081212Z	25.7	146.1	40	26.0	145.6	40.	32.	0.	29.9	144.1	40.	72.	-10.	32.6	143.2	35.	32.	-10.	0.0	0.0	0.	-0.	0.
081218Z	27.0	146.0	40	26.6	146.2	40.	26.	0.	30.0	145.6	40.	10.	-10.	32.7	144.7	35.	177.	-10.	0.0	0.0	0.	-0.	0.
081300Z	28.0	145.6	40	28.2	145.4	40.	16.	0.	31.6	144.3	40.	62.	-10.	35.0	143.8	35.	233.	-10.	0.0	0.0	0.	-0.	0.
081306Z	28.7	145.4	45	28.5	145.3	40.	13.	-5.	30.7	144.7	40.	91.	-5.	33.2	144.0	35.	405.	5.	0.0	0.0	0.	-0.	0.
081312Z	29.3	145.3	50	29.1	145.3	50.	12.	0.	32.0	144.0	40.	73.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081318Z	30.0	145.4	50	29.9	145.2	45.	12.	-5.	32.4	143.2	40.	130.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081400Z	30.9	145.2	50	30.8	145.1	45.	8.	-5.	33.9	143.3	40.	212.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081406Z	32.2	144.5	45	31.8	144.8	45.	28.	0.	35.2	143.0	40.	333.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081412Z	33.1	143.4	45	32.9	143.4	45.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081418Z	34.1	141.6	45	34.1	141.3	55.	15.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081500Z	34.6	139.1	45	34.3	139.3	50.	21.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081506Z	35.2	136.2	30	35.3	136.4	35.	11.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	17.	123.	212.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	12.	41.	46.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	3.	8.	9.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	0.	-5.	-6.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	12	8	4	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 968. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 12. KNOTS

TROPICAL STORM BEN
FIX POSITIONS FOR CYCLONE NO. 7

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	112227	24.0N 145.3E	PCN 5	T2.0/2.0	INIT OBS	PGTW
2	120000	24.4N 144.7E	PCN 6			PGTW
3	120300	24.5N 145.3E	PCN 4			PGTW
4	120600	24.7N 145.9E	PCN 4			PGTW
5	121200	25.0N 146.7E	PCN 6			PGTW
6	121800	26.7N 145.5E	PCN 6	T2.5/2.5	INIT OBS	PGTW
7	121942	27.3N 145.4E	PCN 6			PGTW
8	122100	28.1N 145.3E	PCN 6			PGTW
9	122206	28.3N 145.4E	PCN 5			PGTW
10	130000	28.0N 145.7E	PCN 6			PGTW
11	130502	28.3N 145.4E	PCN 4	T3.0/3.0-/D0.5/11HRS		PGTW
12	130900	28.7N 145.5E	PCN 4		EXP LLCC	PGTW
13	131200	29.0N 145.4E	PCN 6			PGTW
14	131600	29.5N 145.4E	PCN 6	T2.5/2.5-/S0.0/11HRS		PGTW
15	131800	29.9N 145.2E	PCN 6			PGTW
16	132144	30.6N 145.1E	PCN 6			PGTW
17	140000	30.8N 145.2E	PCN 4			PGTW
18	140450	31.8N 144.7E	PCN 4	T2.0/3.0 /W1.0/13HRS		PGTW
19	140900	32.5N 144.2E	PCN 6			PGTW
20	140942	32.6N 144.0E	PCN 3	T1.5/1.5	INIT OBS	RODN
21	141200	33.1N 143.3E	PCN 6		EXP LLCC	PGTW
22	141600	33.5N 142.3E	PCN 6	T2.0/2.5 /W0.5/11HRS	EXP LLCC	PGTW
23	141800	34.1N 141.2E	PCN 6			PGTW
24	142041	34.4N 140.1E	PCN 5		EXP LLCC	PGTW
25	142303	34.3N 139.7E	PCN 3			PGTW
26	150000	34.5N 139.6E	PCN 4		EXP LLCC	PGTW
27	150600	35.0N 136.5E	PCN 6	T1.0/2.0-/W1.0/14HRS		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN-DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	120742	25.2N 146.0E	1500FT		997	40 140 45	200 40 140 63	7 3			29	1

2	122053	27.8N 145.7E	1500FT		994	30	200	35	190	35	120	30	10	5							2
3	122312	28.0N 145.5E	1500FT		994	45	300	10	060	40	300	10	10	5			+25	+26	+23	29	2
4	130842	28.9N 145.4E	700MB	2987		35	110	40	060	34	270	25	5	6			+12	+14	+11		3
5	131134	29.2N 145.2E	700MB	2976					120	55	040	21	3	5	CIRCULAR	20	+12	+14	+11		3
6	132357	30.8N 145.1E	700MB	2994	990	45	130	25	230	47	130	13	6	1			+14	+17	+10		4
7	140254	31.3N 144.9E	700MB	2989		55	070	36	160	62	070	26	6	2			+10	+18	+ 6		4
8	140833	32.3N 144.2E	700MB	3017		35	180	10	190	41	110	30	10	10				+19			5
9	141102	32.0N 143.5E	700MB	3014					170	51	090	25	10	10			+17	+20	+12		5
10	142113	34.2N 140.2E	700MB	2992		65	120	52	120	52	040	65	2	6			+12	+16	+12		6
11	142341	34.2N 139.4E	700MB	3022		20	130	30	190	34	130	30	0	5			+14	+18	+10		6

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	141600	33.9N 142.2E	LAND				5//// /////		35.3N 138.7E	47639
2	141700	33.9N 141.9E	LAND				4//// 73019		35.3N 138.7E	47639
3	141800	34.1N 141.5E	LAND				5//// 73021		35.3N 138.7E	47639
4	141900	33.9N 141.0E	LAND				5//// 72719		35.3N 138.7E	47639
5	142000	34.1N 140.8E	LAND				6//// 72818		35.3N 138.7E	47639
6	150200	34.5N 138.2E	LAND				5//// /////		35.2N 137.0E	47636

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	150600	35.3N 136.4E	035	022	WMO 47636, 47899.47600
2	151200	37.0N 136.9E	030	065	WMO 47600

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL DEPRESSION 06
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
080800Z	16.0	111.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080806Z	15.1	112.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080812Z	14.7	113.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080818Z	14.6	114.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-2.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080900Z	14.4	114.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080906Z	14.1	115.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080912Z	14.2	115.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080918Z	14.5	115.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081000Z	14.9	115.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081006Z	15.1	115.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081012Z	15.4	115.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081018Z	15.8	115.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081100Z	16.0	115.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081106Z	16.4	115.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081112Z	16.7	116.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081118Z	17.0	116.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081200Z	17.3	116.5	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081206Z	17.6	116.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081212Z	17.8	116.8	30	18.0	116.2	30.	36.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081218Z	18.0	116.9	30	17.8	116.2	30.	42.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081300Z	18.3	117.1	30	18.3	116.9	30.	11.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	30.	0.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	25.	0.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	0.	0.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	0.	0.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	3	0	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 555. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 5. KNOTS

TROPICAL DEPRESSION TD06W-A
FIX POSITIONS FOR CYCLONE NO. 6

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	090000	14.5N 114.5E	PCN 6	T1.0/1.0	INIT OBS	PGTW
2	090300	14.4N 114.8E	PCN 6			PGTW
3	090600	14.1N 114.9E	PCN 6			PGTW
4	090734	14.1N 115.5E	PCN 3	T1.5/1.5		RPMK
5	090739	14.6N 114.8E	PCN 5	T1.0/1.0	INIT OBS	RODN
6	090900	14.1N 115.2E	PCN 6			PGTW
7	091127	14.1N 115.3E	PCN 6			RPMK
8	091600	14.4N 115.1E	PCN 6	T1.0/1.0-/D1.0/13HRS		PGTW
9	091800	14.6N 115.1E	PCN 6			PGTW
10	092010	14.3N 115.9E	PCN 5			RPMK
11	092100	14.6N 115.2E	PCN 6			PGTW
12	092226	15.1N 114.8E	PCN 5	T0.5/1.5 /W1.0/15HRS		RPMK
13	092226	14.0N 115.1E	PCN 5			RODN
14	100000	14.0N 115.0E	PCN 6			PGTW
15	100052	15.0N 115.6E	PCN 5	T1.0/1.5 /W0.5/17HRS		RPMK
16	100300	15.2N 115.0E	PCN 6			PGTW
17	100721	14.9N 115.5E	PCN 5	T1.5/1.5 /S0.0/24HRS		RPMK
* 18	101106	15.3N 115.5E	PCN 5	T1.5/1.5 /S0.0/24HRS		RPMK
19	101200	15.6N 116.1E	PCN 6		ULCC FIX	PGTW
20	101600	15.8N 115.5E	PCN 6		ULCC FIX	PGTW
* 21	102006	15.9N 116.6E	PCN 5	T1.5/1.5 /S0.0/24HRS		RPMK
22	102205	16.0N 116.2E	PCN 5	T1.5/1.5 /D1.0/24HRS		RPMK
23	110000	16.7N 115.7E	PCN 6			PGTW
* 24	110030	15.0N 115.1E	PCN 5	T1.0/1.0	INIT OBS	RODN
25	120300	17.0N 116.0E	PCN 4	T1.0/1.0	INIT OBS EXP LLCC	PGTW
26	120600	17.4N 116.6E	PCN 4		EXP LLCC	PGTW
27	120657	17.7N 116.4E	PCN 3	T2.5/2.5	INIT OBS	RPMK
28	120900	17.6N 116.2E	PCN 6			PGTW
29	121200	17.5N 116.3E	PCN 6			PGTW
30	121800	17.7N 115.9E	PCN 6	T2.5/2.5	INIT OBS	PGTW
* 31	122100	17.7N 115.0E	PCN 6			PGTW

* 32	122304	17.9N 115.0E	PCN 5	T2.5/2.5 /S0.0/24HRS	RPMK
33	130000	18.8N 116.7E	PCN 6		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	101021	15.0N 115.4E	1500FT		1000			7 40			+25 +22 27	4
2	110240	15.8N 115.2E	1500FT		1002	15 210 45	060 17 280 34	15 10			+26 +24 31	5
3	120247	17.5N 116.6E	1500FT		999	40 210 70	020 23 300 40	8 10			+27 +26 +23	6
4	130008	18.7N 116.9E	1500FT		1005	25 120 90	060 15 120 90	5 15			+25 +24	7
5	130303	18.5N 117.2E	1500FT		1005	20 230 60	270 24 230 60	5 20			+26 +25 +24	7

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM CARMEN
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
081306Z	19.2	119.4	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081312Z	19.4	120.2	30	19.7	121.3	30.	65.	0.	21.9	124.6	25.	121.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081318Z	19.6	120.8	30	20.0	120.8	40.	24.	10.	22.2	124.2	45.	164.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081400Z	19.8	121.5	35	19.8	121.6	40.	6.	5.	21.1	124.2	45.	230.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081406Z	19.9	122.7	40	20.1	122.4	40.	21.	0.	21.5	125.0	45.	280.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081412Z	19.9	124.4	45	19.8	124.2	45.	13.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081418Z	20.2	126.2	40	20.0	126.0	40.	16.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081500Z	21.0	128.3	30	21.1	128.2	30.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081506Z	22.0	130.0	30	22.1	129.9	30.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	20.	199.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	12.	105.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	2.	14.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	2.	4.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	8	4	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 631. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 13. KNOTS

TROPICAL STORM CARMEN
FIX POSITIONS FOR CYCLONE NO. 6

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	130644	19.4N	120.3E	PCN 5	T1.0/1.5 /W1.5/13HRS		PGTW
2	130900	19.4N	120.5E	PCN 6			PGTW
3	131200	19.7N	120.8E	PCN 6		ULCC FIX	PGTW
4	131600	19.8N	120.7E	PCN 6	T1.5/1.5 /W1.0/10HRS		PGTW
5	131800	20.0N	121.0E	PCN 6			PGTW
6	132100	20.3N	121.2E	PCN 6			PGTW
7	132325	19.4N	121.5E	PCN 5			PGTW
8	140300	19.8N	121.9E	PCN 6			PGTW
9	140600	20.0N	122.2E	PCN 6			PGTW
10	140632	20.0N	122.7E	PCN 6	T1.5/1.5 /S0.0/14HRS		PGTW
11	140900	20.0N	123.1E	PCN 6			PGTW
12	141200	20.3N	123.8E	PCN 6			PGTW
13	141600	20.3N	124.4E	PCN 6	T1.5/1.5 /S0.0/10HRS		PGTW
14	141800	20.4N	124.8E	PCN 6			PGTW
15	142303	21.0N	127.5E	PCN 6			PGTW
16	142303	20.4N	128.2E	PCN 5	T1.5/1.5	INIT OBS	RPMK

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION		FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG			MAX-FLT-LVL-WND DIR/VEL/BRG/RNG				ACCRY NAV/MET		EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/	IN/	DP/SST	MSN NO.
1	131344	19.8N	120.0E	700MB	3065	997				210	29	150	77	5	20				+12	+12	9
2	140328	19.9N	122.1E	700MB	3052	996	35	310	30	010	36	310	27	10	8				+13		10
3	140633	19.8N	122.8E	700MB	3058		30	190	46	020	30	290	46	12	7						10
4	141107	19.8N	124.2E	700MB	3016	992	30	240	90	210	40	090	60	5	5			+15	+16		11
5	141426	20.0N	125.2E	700MB	3013					340	23	280	60	5	5			+13	+16		11
6	142142	20.7N	127.6E	700MB	3023		35	120	90	240	54	100	30	5	5						12

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION		RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR	TDDFF	COMMENTS	RADAR POSITION		SITE WMO NO.
1	132000	19.6N	120.7E	LAND				10801	4////	EYE 100 PCT CIR	18.3N	121.6E	98231
2	132100	19.7N	121.1E	LAND				10811	40401	EYE 100 PCT CIR	18.3N	121.6E	98231
3	132130	19.6N	121.0E	LAND				10812	40901	EYE 100 PCT CIR	18.3N	121.6E	98231

4	132200	19.7N	121.3E	LAND	10811	40401	EYE 100 PCT CIR	18.3N	121.6E	98231
5	132300	19.7N	121.3E	LAND	10811	40401	EYE 100 PCT CIR	18.3N	121.6E	98231
6	132330	19.8N	121.4E	LAND	10781	40402	EYE 80 PCT CIR	18.3N	121.6E	98231
7	140000	19.8N	121.5E	LAND	10651	40601	EYE 100 PCT CIR	18.3N	121.6E	98231
8	141400	20.0N	124.2E	LAND	10341	70927		16.3N	120.6E	98321
9	141500	20.0N	124.3E	LAND	4///1	50903		18.3N	121.6E	98231

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM DOM
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
081706Z	15.2	140.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081712Z	15.4	139.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081718Z	15.4	138.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081800Z	15.2	137.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081806Z	15.0	136.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081812Z	15.2	135.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081818Z	15.6	134.5	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081900Z	15.9	133.8	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081906Z	16.1	133.2	40	16.3	133.2	35.	12.	-5.	18.6	131.3	45.	99.	-5.	20.9	130.7	60.	281.	25.	23.9	130.7	75.	442.	45.
081912Z	16.3	132.8	45	16.5	132.7	40.	13.	-5.	18.6	131.2	55.	109.	10.	21.0	130.7	65.	314.	35.	23.0	130.7	80.	520.	45.
081918Z	16.5	132.4	50	16.9	132.3	40.	25.	-10.	19.0	131.1	60.	149.	20.	21.4	130.7	70.	358.	40.	23.4	130.7	85.	600.	40.
082000Z	16.9	132.2	55	16.8	132.2	45.	6.	-10.	18.0	130.9	60.	230.	25.	19.9	130.3	70.	447.	40.	22.0	130.4	80.	693.	30.
082006Z	17.4	132.5	50	17.6	132.2	45.	21.	-5.	22.0	134.8	60.	128.	25.	23.8	137.4	70.	80.	40.	25.5	140.2	80.	157.	30.
082012Z	18.0	133.0	45	17.8	132.8	40.	17.	-5.	19.9	135.1	50.	83.	20.	21.9	137.8	55.	171.	20.	23.6	140.8	65.	198.	20.
082018Z	18.7	133.7	40	18.6	133.4	40.	18.	0.	20.6	136.0	50.	78.	20.	22.4	138.7	55.	193.	10.	24.1	141.6	65.	155.	25.
082100Z	19.3	134.7	35	19.4	134.8	25.	8.	-10.	22.2	138.8	25.	50.	-5.	24.6	142.2	20.	28.	-30.	0.0	0.0	0.	-0.	0.
082106Z	20.0	135.6	35	20.0	135.8	25.	11.	-10.	22.6	139.2	25.	45.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082112Z	20.7	136.3	30	20.7	136.6	25.	17.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082118Z	21.4	137.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082200Z	22.2	137.9	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082206Z	23.2	138.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082212Z	23.8	140.1	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082218Z	24.2	141.6	45	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082300Z	24.9	142.6	50	24.9	142.7	45.	5.	-5.	29.0	147.5	40.	290.	0.	31.7	153.7	35.	623.	-15.	0.0	0.0	0.	-0.	0.
082306Z	25.4	143.1	50	25.6	143.7	50.	35.	0.	28.7	148.0	40.	270.	-5.	30.3	154.1	30.	625.	-15.	0.0	0.0	0.	-0.	0.
082312Z	25.8	143.5	45	25.9	143.8	45.	17.	0.	27.9	145.0	35.	127.	-15.	29.8	150.0	25.	446.	-15.	0.0	0.0	0.	-0.	0.
082318Z	25.5	144.0	40	25.9	143.9	45.	25.	5.	27.4	144.8	30.	81.	-20.	29.3	147.8	25.	341.	-10.	0.0	0.0	0.	-0.	0.
082400Z	25.1	144.3	40	25.1	144.2	35.	5.	-5.	25.9	141.8	30.	93.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082406Z	25.3	144.7	45	25.6	144.4	35.	24.	-10.	26.4	143.2	35.	47.	-10.	27.7	142.3	25.	216.	0.	0.0	0.0	0.	-0.	0.
082412Z	25.8	144.7	50	25.7	144.8	35.	8.	-15.	27.2	145.2	35.	186.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082418Z	26.2	144.1	50	26.0	144.7	40.	34.	-10.	27.5	144.6	50.	199.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082500Z	26.5	143.4	50	26.3	143.7	35.	20.	-15.	28.3	142.8	45.	132.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082506Z	27.1	142.8	45	27.5	143.4	35.	40.	-10.	29.4	143.1	40.	143.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082512Z	27.9	141.8	40	27.6	142.0	30.	21.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082518Z	29.1	141.3	35	29.2	140.8	30.	27.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082600Z	30.0	141.2	30	30.2	141.1	25.	13.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082606Z	31.2	141.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	18.	134.	317.	395.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	11.	92.	213.	198.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	7.	13.	23.	34.	0.	0.	0.	0.
AVG INTENSITY BIAS	-7.	4.	10.	34.	0.	0.	0.	0.
NUMBER OF FORECASTS	23	19	13	7	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1059. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 9. KNOTS

TROPICAL STORM DOM
FIX POSITIONS FOR CYCLONE NO. 8

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	171800	15.1N 137.8E	PCN 6		ULCC FIX	PGTW
* 2	180000	15.7N 138.6E	PCN 6	T1.0/1.0	INIT OBS	PGTW
* 3	180300	15.9N 137.9E	PCN 6			PGTW
4	180600	15.1N 136.4E	PCN 6			PGTW
5	180900	15.2N 136.2E	PCN 6			PGTW
6	181030	15.3N 135.9E	PCN 6			PGTW
7	181200	15.4N 135.6E	PCN 6			PGTW
8	181600	15.4N 134.5E	PCN 6	T1.0/1.0 /S0.0/16HRS		PGTW
9	181800	15.4N 133.8E	PCN 6			PGTW
10	182050	15.7N 134.2E	PCN 5			PGTW
11	182317	15.7N 133.9E	PCN 5	T2.5/2.5 /D1.5/07HRS		PGTW
12	190300	16.2N 133.8E	PCN 4			PGTW
13	190530	16.4N 133.5E	PCN 3			PGTW
14	190930	16.1N 133.0E	PCN 4			PGTW
15	191200	16.4N 132.7E	PCN 6	T2.5/2.5 /D1.5/12HRS		PGTW

16	191015	17.0N 132.5E	PCN 5			PGTW
17	192037	16.9N 132.1E	PCN 5			PGTW
18	192255	17.1N 132.0E	PCN 3	T2.0/2.0	INIT OBS	RPMK
19	192256	16.7N 132.1E	PCN 3	T3.0/3.0 /D0.5/11HRS		PGTW
20	200000	16.8N 132.2E	PCN 4			PGTW
21	200300	17.1N 132.3E	PCN 4			PGTW
22	200510	17.5N 132.5E	PCN 3			PGTW
23	200600	17.6N 132.6E	PCN 4			PGTW
24	200900	17.7N 132.7E	PCN 6			PGTW
25	201200	17.9N 132.9E	PCN 6		ULCC FIX	PGTW
26	201802	18.9N 133.5E	PCN 5			PGTW
27	202234	19.2N 134.4E	PCN 3	T2.0/2.0	INIT OBS	RODN
28	202234	19.1N 134.6E	PCN 3	T3.0/3.0 /S0.0/24HRS		PGTW
29	210300	19.7N 135.2E	PCN 4			PGTW
30	210505	19.9N 135.5E	PCN 6			PGTW
31	210600	20.2N 135.9E	PCN 6			PGTW
32	211600	21.2N 137.0E	PCN 6			PGTW
* 33	211750	21.2N 135.6E	PCN 5			RPMK
34	212100	22.0N 138.0E	PCN 6			PGTW
35	212212	22.0N 137.5E	PCN 5	T2.0/2.5 /W1.0/24HRS		PGTW
36	212212	21.0N 137.5E	PCN 5	T2.5/2.5 /D0.5/24HRS		RODN
37	220300	22.0N 138,1E	PCN 4			PGTW
38	220457	22.3N 138.9E	PCN 3			PGTW
39	220600	22.0N 139.0E	PCN 4			PGTW
40	220835	23.0N 139.6E	PCN 5			PGTW
41	221600	24.0N 141.3E	PCN 6			PGTW
42	221730	23.9N 141.5E	PCN 4		EXP LLCC	PGTW
43	221934	24.2N 142.0E	PCN 4		EXP LLCC	PGTW
44	222115	24.5N 142.2E	PCN 3		EXP LLCC	PGTW
45	222150	24.6N 142.5E	PCN 3	T2.0/2.0 /S0.0/24HRS	EXP LLCC	PGTW
46	230000	24.9N 142.7E	PCN 4		EXP LLCC	PGTW
47	230300	25.2N 143.1E	PCN 4		EXP LLCC	PGTW
48	230441	25.2N 143.4E	PCN 3			PGTW
49	230600	25.4N 143.4E	PCN 4		EXP LLCC	PGTW
50	230900	25.5N 143.6E	PCN 4		EXP LLCC	PGTW
51	231200	25.8N 143.7E	PCN 4	T2.5/2.5-/D0.5/14HRS	EXP LLCC	PGTW
52	231600	25.7N 143.8E	PCN 4		EXP LLCC	PGTW
53	231800	25.9N 143.9E	PCN 4			PGTW
54	232054	25.3N 144.2E	PCN 3		EXP LLCC	PGTW
55	232310	25.5N 144.0E	PCN 3	T3.0/3.0	INIT OBS	RKSO
56	240000	25.2N 144.2E	PCN 4	T2.5/2.5 /S0.0/12HRS		PGTW
57	240300	25.4N 144.3E	PCN 6			PGTW
58	240600	25.6N 144.6E	PCN 6			PGTW
59	241000	25.7N 144.0E	PCN 6			PGTW
60	241200	25.5N 144.6E	PCN 6	T3.0/3.0 /D0.5/12HRS		PGTW
61	241600	26.0N 144.7E	PCN 6			PGTW
62	241713	26.0N 144.5E	PCN 6			PGTW
63	242033	25.9N 144.0E	PCN 5			PGTW
64	242240	26.3N 143.2E	PCN 5	T3.5/3.5 /D1.0/11HRS		PGTW
65	242240	26.3N 144.0E	PCN 3	T3.0/3.0 /S0.0/24HRS		RKSO
66	250000	26.5N 143.4E	PCN 6			PGTW
67	250300	27.0N 143.3E	PCN 6			PGTW
* 68	250558	27.6N 143.9E	PCN 5			PGTW
69	250946	27.3N 142.5E	PCN 6			PGTW
* 70	251200	27.1N 141.9E	PCN 6	T2.0/2.5-/W1.5/13HRS		PGTW
71	251600	28.9N 141.2E	PCN 4			PGTW
72	251800	29.3N 140.8E	PCN 4			PGTW
73	251843	29.5N 141.1E	PCN 3		EXP LLCC	PGTW
74	252012	29.8N 141.3E	PCN 3			PGTW
75	252226	30.0N 141.3E	PCN 3	T1.5/2.5 /W2.0/24HRS	EXP LLCC	PGTW
76	252226	30.0N 141.1E	PCN 3	T2.0/3.0-/W1.0/24HRS		RKSO
77	260000	30.1N 141.4E	PCN 4			PGTW
78	260300	30.7N 141.5E	PCN 4			PGTW
79	260545	31.5N 141.7E	PCN 5			PGTW
80	260852	31.6N 141.4E	PCN 5			PGTW
81	261200	32.3N 141.2E	PCN 6			PGTW
82	261956	32.6N 142.4E	PCN 4			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	190735	16.2N 133.0E	1500FT		1004	40 130 10		10 2			+26 +27 30	3
2	192125	16.7N 132.2E	1500FT		1002	50 140 32	240 33 140 25	7 4			+25 +23 31	4
3	192350	16.8N 132.2E	700MB	3112		55 220 27	020 22 030 60	10 3			+11 +12 + 8	4
4	200043	17.5N 132.8E	700MB	3089		35 190 90	240 37 170 95	10 10			+12 +14 +11	5
5	201039	17.8N 132.5E	700MB	3083			200 24 050 30	10 10			+12 +13 + 8	5
6	202059	19.1N 134.4E	700MB	3124		35 150 60	210 40 140 150	5 20			+14 +12	6
7	202343	19.3N 134.8E	1500FT		1003	35 020 5	270 36 220 150	5 2			+27 +26 25	6
8	210030	20.3N 135.9E	1500FT		1002	35 150 50	210 33 140 100	8 10				7
9	211120	20.5N 135.6E	700MB	3116			340 18 220 120	10 15			+10 +14 + 9	7
10	220612	23.4N 138.5E	1500FT		1003	30 160 220	220 30 140 185	5 1			+25 +25 +23	8
11	222351	24.8N 142.7E	1500FT		995	40 090 10	360 37 270 20	7 3			+23 +23 +22	9
12	232059	25.4N 144.2E	1500FT			35 360 8	090 30 360 8	5 3			+28 +28 25	11
13	232316	25.1N 144.2E	1500FT		999	35 330 20	060 40 330 20	5 4			+27 +25 26	11
14	240041	25.5N 144.7E	700MB	3065		30 210 75	240 72 220 80	10 3			+15 +20 +11	12
15	241155	25.2N 144.5E	700MB	3092			180 34 140 75	10 4			+15 +13 + 8	12

16	242042	26.0N	144.0E	700MB	3094		50	060	25	100	51	060	50	15	2	+10	+11			13
17	242325	26.5N	143.0E	700MB	3052	990	35	140	135	000	34	350	50	8	5	+11	+12			13
18	251029	27.4N	142.1E	700MB	3122	1007				210	36	110	63	8	7		+12	+11		14
19	251301	28.2N	141.0E	700MB	3110					060	27	320	60	10	5					14
20	252032	29.3N	140.0E	700MB	3105		25	090	30	190	26	090	90	5	8	+12	+12	+10		15
21	252340	30.0N	141.2E	700MB	3120	1003	25	270	25	100	20	030	40	5	10		+26	+22	29	15

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL DEPRESSION 09
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
082506Z	25.5	128.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082512Z	25.6	128.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082518Z	26.6	128.7	20	0.0	0.0	0.	-0.	0.	0.	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082600Z	27.6	129.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082606Z	29.0	129.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082612Z	30.3	128.9	25	30.3	129.1	25.	10.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082618Z	31.8	128.4	25	31.6	128.6	25.	16.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082700Z	33.3	127.4	30	33.9	127.0	30.	41.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082706Z	34.9	126.9	25	34.9	127.2	25.	15.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	21.	0.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	11.	0.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	0.	0.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	0.	0.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	4	0	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 622. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 13. KNOTS

TROPICAL DEPRESSION TD09W
FIX POSITIONS FOR CYCLONE NO. 9

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	250300	25.4N 128.1E	PCN 6	T1.0/1.0	INIT OBS	PGTW
2	250550	25.5N 128.2E	PCN 5			PGTW
3	250946	25.7N 128.6E	PCN 6			PGTW
4	251200	25.2N 129.0E	PCN 6	T1.5/1.5	INIT OBS ULCC FIX	PGTW
5	251600	26.2N 128.4E	PCN 6		ULCC FIX	PGTW
6	260000	27.0N 129.2E	PCN 6	T2.0/2.0 /D1.0/12HRS		PGTW
7	260300	28.7N 129.3E	PCN 6			PGTW
8	260545	28.9N 129.3E	PCN 5			PGTW
9	260600	29.0N 129.2E	PCN 6			PGTW
10	260900	29.4N 129.1E	PCN 6			PGTW
11	261033	30.0N 129.2E	PCN 3		EXP LLCC	RPMK
12	261105	30.1N 129.0E	PCN 3			RKSO
13	261200	30.3N 128.8E	PCN 6	T1.5/1.5 /S0.0/12HRS		PGTW
14	261600	31.2N 128.6E	PCN 6			PGTW
15	262132	32.7N 128.0E	PCN 3	T1.5/1.5	EXP LLCC	RPMK
16	262346	33.3N 127.9E	PCN 3	T1.5/1.5	INIT OBS	RKSO
17	270000	33.4N 127.5E	PCN 4	T1.5/2.0 /W0.5/12HRS		PGTW
18	270300	34.2N 127.6E	PCN 6			PGTW
19	270600	34.9N 126.9E	PCN 6			PGTW
20	271044	36.0N 127.4E	PCN 5			RKSO

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIEN-TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	262326	33.3N 127.3E	700MB	3001		25 130 55	180 35 120 125	5 8			+14 +14 +11	1

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	270000	33.3N 126.9E	030	020	WMO 47184, 47189
2	270600	34.9N 127.2E	025	025	WMO 47156, 47168

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON ELLEN
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
082700Z	9.8	183.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082706Z	10.2	181.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082712Z	10.7	180.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082718Z	11.3	178.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082800Z	11.8	177.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082806Z	12.2	176.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082812Z	12.7	174.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082818Z	13.1	173.0	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082900Z	13.1	171.3	35	13.0	171.3	35.	6.	0.	14.2	164.8	45.	74.	5.	15.0	160.3	55.	270.	10.	15.5	155.8	75.	412.	40.
082906Z	13.2	169.9	35	13.2	170.2	35.	18.	0.	13.9	165.9	45.	154.	0.	14.8	161.8	55.	386.	10.	15.3	157.4	75.	569.	40.
082912Z	13.2	168.5	40	13.2	168.8	40.	18.	0.	14.0	165.2	50.	226.	10.	15.3	161.5	65.	484.	25.	17.0	158.2	85.	792.	60.
082918Z	13.1	166.8	45	13.4	166.9	45.	19.	0.	14.9	163.0	55.	274.	15.	16.0	160.3	75.	550.	35.	17.3	157.9	95.	909.	65.
083000Z	13.0	165.1	40	13.2	165.2	35.	13.	-5.	13.8	159.9	50.	195.	5.	15.0	155.9	70.	394.	35.	16.2	151.8	90.	654.	55.
083006Z	12.5	163.7	45	13.1	163.8	45.	36.	0.	13.3	158.8	65.	202.	20.	14.2	154.8	75.	407.	40.	15.5	150.9	95.	653.	55.
083012Z	11.9	162.0	40	12.3	162.4	40.	34.	0.	12.9	157.9	60.	231.	20.	13.6	154.6	70.	508.	45.	14.5	151.4	90.	730.	45.
083018Z	11.4	160.0	40	12.0	160.3	45.	40.	5.	12.2	154.9	65.	164.	25.	13.4	151.1	75.	452.	45.	14.6	148.1	90.	620.	40.
083100Z	10.9	158.4	45	11.2	158.4	45.	18.	0.	11.0	151.7	65.	51.	30.	11.7	146.1	75.	227.	40.	13.3	141.3	95.	298.	40.
083106Z	10.5	156.9	45	10.8	157.0	45.	19.	0.	10.9	150.8	65.	103.	30.	11.8	145.4	75.	264.	35.	13.3	140.7	95.	323.	35.
083112Z	10.3	155.0	40	10.1	155.2	40.	17.	0.	10.0	149.5	60.	146.	35.	11.2	144.1	70.	260.	25.	12.4	139.3	85.	302.	20.
083118Z	10.2	153.0	40	10.1	153.4	40.	24.	0.	10.9	147.4	60.	188.	30.	12.2	142.5	75.	267.	25.	14.2	137.8	90.	330.	20.
090100Z	10.3	151.2	35	10.2	151.2	35.	6.	0.	11.2	143.5	60.	132.	25.	12.7	137.8	75.	163.	20.	14.3	133.2	90.	149.	15.
090106Z	10.2	149.2	35	10.4	149.2	35.	12.	0.	11.9	141.8	55.	162.	15.	13.7	136.0	70.	192.	10.	15.6	131.5	85.	163.	0.
090112Z	9.4	147.1	25	10.1	147.2	35.	42.	10.	10.8	139.7	55.	100.	10.	12.5	133.8	70.	102.	5.	14.5	129.2	85.	53.	-5.
090118Z	9.1	144.8	30	8.4	144.7	35.	42.	5.	8.3	136.9	50.	139.	0.	9.4	131.1	65.	160.	-5.	11.3	126.7	80.	223.	-15.
090200Z	9.0	143.4	35	9.5	143.0	25.	38.	-10.	9.6	137.4	45.	25.	-10.	10.6	132.7	60.	118.	-15.	12.3	129.1	75.	174.	-20.
090206Z	9.2	141.8	40	9.2	141.8	40.	0.	0.	9.6	136.4	45.	59.	-15.	10.9	131.8	60.	142.	-25.	12.8	128.3	70.	203.	-25.
090212Z	9.2	140.2	45	9.3	140.3	40.	8.	-5.	10.3	135.4	50.	69.	-15.	11.8	130.5	65.	126.	-25.	13.1	126.7	75.	228.	-20.
090218Z	9.5	138.9	50	9.3	139.1	45.	17.	-5.	10.2	134.3	55.	101.	-15.	11.5	129.5	65.	179.	-30.	12.9	125.6	80.	260.	-20.
090300Z	10.0	137.5	55	9.8	137.6	60.	13.	5.	10.8	132.9	60.	114.	-15.	12.5	128.8	70.	157.	-25.	14.6	125.3	85.	204.	-35.
090306Z	10.5	136.0	60	10.5	136.0	50.	0.	-10.	12.2	131.9	65.	85.	-20.	14.0	128.2	75.	137.	-20.	15.7	124.5	90.	173.	-35.
090312Z	10.9	134.4	65	10.9	134.3	65.	6.	0.	13.2	128.8	85.	55.	-5.	13.8	124.1	90.	205.	-5.	14.2	119.1	75.	324.	-45.
090318Z	11.3	133.0	70	11.5	132.8	65.	17.	-5.	13.5	127.5	85.	93.	-10.	14.0	122.6	85.	240.	-15.	14.2	117.6	75.	355.	-25.
090400Z	12.3	131.7	75	12.3	131.7	65.	0.	-10.	13.9	127.1	85.	84.	-10.	14.3	122.2	85.	237.	-35.	14.7	117.2	75.	325.	-15.
090406Z	13.0	130.7	85	13.0	130.8	70.	6.	-15.	14.5	125.9	90.	102.	-5.	14.5	121.0	80.	261.	-45.	15.7	116.2	85.	285.	0.
090412Z	13.7	129.6	90	13.8	129.4	90.	13.	0.	15.3	124.7	115.	110.	20.	16.3	120.3	70.	180.	-50.	18.7	116.8	75.	184.	-10.
090418Z	14.4	128.8	95	14.5	128.7	95.	8.	0.	17.0	124.8	120.	21.	20.	19.2	120.8	90.	26.	-10.	21.0	117.0	80.	66.	0.
090500Z	15.0	128.0	95	15.1	128.0	95.	6.	0.	16.6	126.3	120.	145.	0.	17.2	124.8	130.	291.	40.	18.0	122.4	115.	361.	40.
090506Z	15.9	126.9	95	16.0	127.0	95.	8.	0.	17.8	124.7	120.	91.	-5.	18.7	122.8	105.	210.	20.	19.3	120.9	90.	303.	15.
090512Z	16.8	125.8	95	16.7	125.9	95.	8.	0.	18.6	123.3	140.	63.	20.	18.9	121.1	130.	166.	45.	18.7	119.5	120.	303.	45.
090518Z	17.2	125.1	100	17.2	124.9	100.	11.	0.	18.8	122.0	120.	47.	20.	19.2	120.4	110.	171.	30.	19.4	119.1	100.	313.	30.
090600Z	17.8	124.1	120	17.8	124.0	120.	6.	0.	19.0	121.1	120.	54.	30.	19.3	119.5	100.	179.	25.	19.8	117.8	100.	283.	35.
090606Z	18.3	123.2	125	18.4	123.1	125.	8.	0.	20.0	119.7	115.	41.	30.	20.1	117.2	100.	92.	25.	20.1	115.0	95.	197.	45.
090612Z	18.7	122.2	120	18.7	122.0	120.	11.	0.	20.0	118.8	120.	72.	35.	21.6	116.0	105.	108.	30.	22.1	115.7	100.	231.	70.
090618Z	19.0	121.2	100	19.0	121.0	110.	11.	10.	20.6	118.1	120.	49.	40.	22.1	116.1	105.	114.	35.	0.0	0.0	0.	-0.	0.
090700Z	19.3	120.2	90	19.3	120.1	85.	6.	-5.	21.1	117.4	105.	58.	30.	22.7	115.6	90.	127.	25.	0.0	0.0	0.	-0.	0.
090706Z	19.5	119.2	85	19.7	119.1	90.	13.	5.	21.4	115.7	105.	31.	30.	22.9	113.6	75.	60.	25.	0.0	0.0	0.	-0.	0.
090712Z	19.7	118.3	85	19.7	118.2	95.	6.	10.	20.7	115.1	95.	30.	20.	22.0	113.0	75.	91.	45.	0.0	0.0	0.	-0.	0.
090718Z	20.0	117.5	80	19.7	117.0	95.	25.	15.	20.7	115.0	95.	78.	25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090800Z	20.5	116.6	75	20.3	116.4	75.	16.	0.	21.8	113.1	65.	25.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090806Z	20.9	115.8	75	20.9	115.6	75.	11.	0.	22.6	112.2	50.	23.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090812Z	21.3	114.9	75	21.4	115.0	70.	8.	-5.	23.2	112.7	45.	65.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090818Z	21.7	114.1	70	21.7	114.3	70.	11.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090900Z	22.1	113.4	65	22.2	113.4	65.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090906Z	22.5	112.6	50	22.7	112.6	50.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090912Z	22.8	111.6	30	22.7	111.5	30.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	15.	101.	223.	339.	13.	98.	212.	311.
AVG RIGHT ANGLE ERROR	11.	60.	123.	178.	10.	61.	122.	178.
AVG INTENSITY MAGNITUDE ERROR	3.	17.	27.	31.	3.	16.	26.	28.
AVG INTENSITY BIAS	-0.	11.	11.	15.	-1.	10.	9.	11.
NUMBER OF FORECASTS	47	43	39	35	44	40	36	32

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 4462. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 14. KNOTS

TYPHOON ELLEN
FIX POSITIONS FOR CYCLONE NO. 10

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	270000	9.8N 176.6W	PCN 6	T2.0/2.0	INIT OBS	PGTW
2	270300	9.8N 178.3W	PCN 6			PGTW
3	270600	10.1N 177.7W	PCN 6		ULCC FIX	PGTW
4	270650	10.0N 178.3W	PCN 6	T2.5/2.5 /D1.0/20HRS		KGWC
5	270900	10.4N 178.5W	PCN 6		ULCC FIX	PGTW
6	271200	10.7N 179.9W	PCN 6			PGTW
7	271740	11.5N 178.0E	PCN 6			KGWC
8	271800	11.6N 178.7E	PCN 6			PGTW
9	280000	11.8N 178.0E	PCN 6	T2.0/2.0+/S0.0/24HRS		PGTW
10	280300	11.8N 177.1E	PCN 6			PGTW
11	280600	12.2N 176.0E	PCN 6		ULCC FIX	PGTW
12	280620	12.0N 175.1E	PCN 6	T3.0/3.0 /D0.5/24HRS		KGWC
13	280900	12.3N 175.4E	PCN 6		ULCC FIX	PGTW
14	281200	12.5N 174.8E	PCN 6		ULCC FIX	PGTW
15	281600	13.1N 174.0E	PCN 6	T2.0/2.0	INIT OBS	PGTW
16	281800	13.2N 173.4E	PCN 6		ULCC FIX	PGTW
17	281900	12.9N 172.5E	PCN 6			KGWC
18	282100	13.0N 172.2E	PCN 6			PGTW
19	290000	12.9N 171.2E	PCN 6	T2.5/2.5 /D0.5/08HRS		PGTW
20	290300	12.7N 170.5E	PCN 6			PGTW
21	290326	12.8N 170.2E	PCN 6	T3.0/3.0 /S0.0/21HRS		KGWC
22	290600	13.1N 170.2E	PCN 6			PGTW
23	290900	13.3N 169.6E	PCN 6			PGTW
24	291200	13.2N 168.7E	PCN 6			PGTW
25	291600	13.2N 167.2E	PCN 6	T3.0/3.0 /D1.0/16HRS		PGTW
26	291800	13.3N 166.7E	PCN 6			PGTW
27	292100	13.4N 165.8E	PCN 6		ULCC FIX	PGTW
28	300000	12.9N 164.7E	PCN 6	T2.5/2.5 /S0.0/08HRS		PGTW
29	300300	12.7N 164.0E	PCN 6			PGTW
30	300456	12.6N 163.6E	PCN 5			PGTW
31	300600	12.5N 163.4E	PCN 6			PGTW
32	300900	12.2N 162.6E	PCN 6			PGTW
33	301200	12.1N 161.9E	PCN 6			PGTW
34	301600	11.9N 160.8E	PCN 6	T3.0/3.0 /S0.0/16HRS		PGTW
35	301800	11.8N 160.2E	PCN 6			PGTW
36	302000	11.2N 159.5E	PCN 5			PGTW
37	310000	10.7N 158.4E	PCN 6			PGTW
38	310300	10.6N 157.3E	PCN 6	T3.5/3.5 /D0.5/11HRS		PGTW
39	310600	10.1N 156.2E	PCN 6			PGTW
40	310848	9.6N 155.8E	PCN 5			PGTW
41	311200	9.5N 154.4E	PCN 6			PGTW
42	311600	9.5N 153.4E	PCN 6	T2.5/3.0 /W1.0/13HRS		PGTW
43	311800	9.9N 152.8E	PCN 6			PGTW
44	311947	10.8N 153.3E	PCN 5			PGTW
45	010000	10.5N 151.3E	PCN 6			PGTW
46	010300	10.6N 151.1E	PCN 4	T2.0/2.5+/W0.5/11HRS		PGTW
47	010431	10.7N 150.5E	PCN 6			PGTW
48	010600	10.5N 149.7E	PCN 6			PGTW
49	010827	10.0N 148.6E	PCN 6			PGTW
50	011200	10.1N 146.9E	PCN 6			PGTW
51	011600	9.1N 145.8E	PCN 6	T2.5/2.5 /D0.5/13HRS	ULCC FIX	PGTW
52	011716	8.9N 145.3E	PCN 5		ULCC FIX	PGTW
53	012100	8.8N 143.6E	PCN 6			PGTW
54	020000	9.7N 144.2E	PCN 6			PGTW
55	020300	9.5N 143.5E	PCN 6	T2.5/2.5+/S0.0/11HRS		PGTW
56	020601	9.2N 142.1E	PCN 5			PGTW
57	020900	8.9N 141.1E	PCN 6			PGTW
58	021200	8.7N 140.4E	PCN 6			PGTW
59	021600	9.1N 139.6E	PCN 6	T3.0/3.0 /D0.5/13HRS		PGTW
60	021800	9.2N 139.4E	PCN 6			PGTW
61	022046	9.5N 138.6E	PCN 6			PGTW
62	022254	9.6N 137.9E	PCN 6			PGTW
63	022254	9.7N 138.0E	PCN 5	T3.0/3.0	INIT OBS	RPMK
64	030000	9.8N 137.5E	PCN 6			PGTW
65	030300	10.2N 136.8E	PCN 6	T3.0/3.0 /D0.5/11HRS		PGTW
66	030548	10.7N 136.1E	PCN 5			PGTW
67	030900	11.0N 135.3E	PCN 6			PGTW
68	031200	11.0N 134.6E	PCN 4			PGTW
69	031600	11.5N 133.2E	PCN 6			PGTW
70	031800	11.5N 132.9E	PCN 6			PGTW
71	031833	11.5N 132.7E	PCN 5			PGTW
72	031833	11.3N 133.1E	PCN 5			RPMK
73	032100	12.0N 132.4E	PCN 6			PGTW
74	032233	12.2N 132.2E	PCN 5			PGTW
75	032233	11.7N 132.1E	PCN 5	T4.0/4.0 /D1.0/24HRS		RPMK
76	040000	12.4N 131.8E	PCN 6			PGTW
77	040300	12.8N 131.3E	PCN 2	T4.0/4.0 /D1.0/11HRS		PGTW
78	040536	12.8N 130.7E	PCN 3			PGTW
79	040600	13.3N 130.6E	PCN 4			PGTW

80	040900	13.4N 130.2E	PCN 4			PGTW
81	040905	13.5N 129.9E	PCN 3			PGTW
82	041600	14.1N 129.2E	PCN 6	T4.5/4.5 /D1.0/13HRS		PGTW
83	041800	14.5N 129.0E	PCN 6			PGTW
84	042100	14.9N 128.5E	PCN 2			PGTW
85	042145	14.9N 128.1E	PCN 1		EYE DIA 5NM	PGTW
86	050000	15.1N 128.0E	PCN 4			PGTW
87	050300	15.5N 127.5E	PCN 2	T4.5/4.5 /D0.5/11HRS		PGTW
88	050600	16.0N 126.9E	PCN 2			PGTW
89	050900	16.3N 126.4E	PCN 2			PGTW
90	051200	16.7N 125.9E	PCN 2			PGTW
91	051600	16.9N 125.2E	PCN 2	T5.5/5.5 /D1.0/13HRS		PGTW
92	051800	17.1N 124.9E	PCN 2			PGTW
93	052100	17.5N 124.6E	PCN 2			PGTW
94	052124	17.6N 124.5E	PCN 1			PGTW
95	052330	17.8N 124.1E	PCN 1		EYE DIA 20NM	PGTW
96	052330	17.9N 124.2E	PCN 1	T6.0/6.0	INIT OBS EYE DIA 15NM	RODN
97	060300	18.1N 123.5E	PCN 2	T6.0/6.0-/D1.5/11HRS	EYE DIA 20NM	PGTW
98	060643	18.4N 122.9E	PCN 1	T6.0/6.0	INIT OBS	RPMK
99	060653	18.5N 123.1E	PCN 1			PGTW
100	060900	18.5N 122.5E	PCN 2			PGTW
101	061004	18.3N 122.3E	PCN 2		EYE DIA 12NM	PGTW
102	061200	18.7N 122.1E	PCN 4			PGTW
103	061600	18.8N 121.3E	PCN 4	T4.5/5.5+/W1.0/13HRS		PGTW
104	061800	19.1N 121.1E	PCN 4			PGTW
105	062103	19.0N 120.3E	PCN 4			PGTW
106	062244	19.2N 120.2E	PCN 3	T5.0/6.0+/W1.0/18HRS		RPMK
107	062300	19.3N 120.2E	PCN 3	T4.5/5.5+/W1.5/19HRS		RPMK
108	070000	19.2N 120.2E	PCN 4			PGTW
109	070300	19.4N 119.5E	PCN 4			PGTW
110	070641	19.7N 118.9E	PCN 3	T5.0/6.0	INIT OBS	PGTW
111	070900	19.5N 118.7E	PCN 4			PGTW
112	071200	19.6N 118.3E	PCN 4			PGTW
113	071600	19.4N 117.9E	PCN 4	T4.5/4.5+/S0.0/18HRS		PGTW
114	071800	19.7N 117.8E	PCN 4			PGTW
115	071926	20.0N 117.5E	PCN 4			PGTW
116	072100	20.1N 117.2E	PCN 4			PGTW
117	072223	20.1N 117.0E	PCN 3	T5.0/5.0 /D0.5/23HRS		RPMK
118	072223	20.0N 116.8E	PCN 3	T4.5/4.5	INIT OBS	RODN
119	080000	20.2N 116.4E	PCN 6			PGTW
120	080300	20.7N 116.3E	PCN 6	T4.5/5.0-/W0.5/20HRS		PGTW
121	080600	20.9N 115.6E	PCN 4			PGTW
122	080629	21.0N 115.8E	PCN 3			PGTW
123	080629	21.0N 115.9E	PCN 3	T4.5/5.0 /W0.5/08HRS		RPMK
124	080900	21.5N 115.0E	PCN 6			PGTW
125	081103	21.1N 115.3E	PCN 3			RPMK
126	081103	21.6N 114.7E	PCN 4			RODN
127	081200	21.7N 114.9E	PCN 6			PGTW
128	081600	21.4N 114.4E	PCN 4	T4.5/4.5-/S0.0/13HRS		PGTW
129	081800	21.6N 113.9E	PCN 4			PGTW
130	081913	21.8N 113.8E	PCN 4			PGTW
131	082100	22.1N 113.5E	PCN 4			PGTW
132	082202	21.3N 113.6E	PCN 3	T4.5/4.5		RKSO
133	090000	22.3N 113.1E	PCN 4			PGTW
134	090005	22.0N 113.4E	PCN 3	T4.0/4.5-/W0.5/25HRS		RODN
135	090006	22.2N 113.1E	PCN 3	T4.5/5.0-/W0.5/26HRS		RPMK
136	090300	22.6N 113.0E	PCN 6	T3.5/4.0 /W1.0/11HRS		PGTW
137	090600	22.7N 112.3E	PCN 6			PGTW
138	090750	22.4N 112.2E	PCN 5	T3.0/4.0-/W1.5/25HRS		RPMK
139	090900	22.8N 111.8E	PCN 6			PGTW
*140	091042	22.7N 110.2E	PCN 5			RPMK
141	091104	22.0N 111.5E	PCN 5			RKSO
*142	091104	22.6N 110.2E	PCN 5			RPMK
143	091200	22.4N 111.2E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN-DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	292311	13.1N 165.3E	1500FT		1008	35 270 5	190 50 090 15	8 3			+26 +26	1
2	300153	13.1N 164.7E	1500FT		1007	40 360 15	120 47 360 15	8 3			+24 +25 +25	1
3	300512	12.8N 163.9E	1500FT		1003	50 050 5	140 45 050 5	12 2			+23 +24 +24 31	2
4	300812	12.1N 163.6E	700MB	3159			100 36 010 60	8 20				2
5	302050	10.8N 159.2E	700MB	3143	1010	35 330 70	030 32 330 60	8 15			+10 +10	3
6	302329	11.2N 158.4E	1500FT		1007	45 040 30	110 36 020 70	8 2			+26 +26 30	3
7	310411	10.9N 157.5E	1500FT		1007	30 030 30	130 53 220 20	3 3			+14 +26 +23	4
8	310647	10.8N 156.9E	1500FT		1008	35 330 60	060 41 330 50	8 3			+26 +26 +24	4
9	312130	10.1N 151.6E	1500FT		1006	25 040 90	130 30 060 60	6 8			+23 +25 +25 31	5
10	010529	10.4N 149.3E	1500FT		1006	25 330 80	010 34 330 90	8 5			+27 +26 +25	7
11	010822	9.9N 148.4E	1500FT		1009	20 290 40	120 29 060 115	10 10			+27 +24 +23	7
12	011519	8.7N 145.9E	700MB	3094			110 46 350 50	20 10			+10 +10 +10	8
* 13	011037	8.2N 144.0E	700MB	3106			230 37 090 90	15 12				8
14	020220	9.3N 142.7E	1500FT		999	50 030 5	130 40 020 15	5 1			+23 +24 +22 29	9
15	020821	9.3N 141.2E	700MB	3007	1000	55 030 10	030 60 050 3	8 5	ELLIPTICAL	15 5 360	+11 +13 + 9	10
16	021145	9.2N 140.5E	700MB	3109			090 37 330 60	8 8				10
17	022040	9.8N 138.2E	700MB	2990		45 330 30	080 67 330 60	5 5			+13 +14	11
18	022313	9.9N 137.7E	700MB	3002		65 290 14	210 43 140 120	5 5			+ 9 +15	11

19	030459	10.4N 136.2E	700MB	2994		50	320	35	090	63	330.	70	8	3	CIRCULAR	20			+12 +15 + 8	12
20	030753	10.7N 135.2E	700MB	2975		55	080	60	130	53	080	90	10	3	CIRCULAR	10			+10 +19 +13	12
21	032041	11.9N 132.3E	700MB	2944		70	360	70	120	72	030	100	20	1						13
22	032330	12.2N 131.8E	700MB	2941	985	80	100	5	230	51	140	10	10	1	CIRCULAR	20			+14 +17 +10	13
23	040520	13.0N 130.8E	700MB	2936	982	90	090	6	140	60	050	60	8	1	ELLIPTICAL	30	15	070	+15 +20 +11	14
24	040821	13.3N 130.3E	700MB	2946		55	290	25	210	50	150	97	8	1						14
25	042032	14.0N 128.1E	700MB	2845		40	030	90	160	82	090	15	10	5	ELLIPTICAL	40	30	030		15
26	042335	15.0N 128.1E	700MB	2827	969	55	340	40	340	68	290	10	15	2	CIRCULAR	25			+16 +19 +10	15
27	050805	16.2N 126.6E	700MB	2712	956	70	120	30	190	97	120	29	10	4	CIRCULAR	17			+15 +17	16
28	051044	16.5N 126.1E	700MB	2673					020	83	360	11	10	1	CIRCULAR	15			+16 +19 +13	16
29	052057	17.5N 124.3E	700MB	2560	936	70	040	60	160	109	120	27	5	5	CIRCULAR	12			+12 +17	17
30	052343	17.8N 124.0E	700MB	2482	928	120	360	09	010	109	270	15	5	5	CIRCULAR	10			+11 +21	17
31	062158	19.2N 120.5E	700MB	2765		55	210	25	130	69	360	50	4	1						18
32	062349	19.2N 120.2E	700MB	2793	966	80	090	12	170	71	080	45	8	1	CIRCULAR	20			+17 +20 +15	18
33	070836	19.7N 118.7E	700MB	2756		90	090	15	160	61	090	15	8	5	CIRCULAR	15			+15 +17 +13	19
34	071115	19.6N 118.4E	700MB	2742	959	50	360	120	090	66	070	10	8	2	CIRCULAR	15			+13 +21 + 9	19
35	072236	20.3N 116.8E	700MB	2817	967	60	220	60	180	74	090	30	20	2	CIRCULAR	15			+11 +18 +15	20

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	052300	16.7N 124.2E	LAND				21901 /////		18.3N 121.7E	98231
2	060000	17.8N 123.9E	LAND				22932 42908	EYE 25 PCT ELPTCL DIA 40-60 KMS	18.3N 121.7E	98231
3	060030	17.8N 123.8E	LAND				11992 42702	EYE 50 PCT ELPTCL DIA 50-60 KMS	18.3N 121.7E	98231
4	060100	17.9N 123.7E	LAND				11752 43305	EYE 35 PCT ELPTCL DIA 35-40 KMS	18.3N 121.7E	98231
5	060130	17.9N 123.6E	LAND				11712 42702	EYE 30 PCT ELPTCL DIA 35-40 KMS	18.3N 121.7E	98231
6	060200	18.0N 123.6E	LAND				11832 43602	EYE 30 PCT ELPTCL DIA 40-50 KMS	18.3N 121.7E	98231
7	060230	18.0N 123.5E	LAND				10872 42701	EYE 60 PCT CIR DIA 40 KMS	18.3N 121.7E	98231
8	060300	18.0N 123.5E	LAND				10872 42701	EYE 80 PCT CIR DIA 45 KMS	18.3N 121.7E	98231
9	060330	18.1N 123.4E	LAND				10872 42901	EYE 100 PCT CIR DIA 40 KMS	18.3N 121.7E	98231
10	060500	18.3N 123.3E	LAND				10872 63212	EYE 100 PCT CIR DIA 40 KMS	18.3N 121.7E	98231
11	060600	18.4N 123.0E	LAND				10712 42902		18.3N 121.7E	98231
12	060630	18.4N 122.9E	LAND				10712 43202		18.3N 121.7E	98231
13	060800	18.5N 122.6E	LAND				10742 42802		18.3N 121.7E	98231
14	060900	18.6N 122.5E	LAND				40682 42903		18.3N 121.7E	98231
15	060930	18.6N 122.4E	LAND				10672 42702		18.3N 121.7E	98231
16	061000	18.6N 122.4E	LAND				10521 40000		18.3N 121.7E	98231
17	061030	18.6N 122.3E	LAND				10421 42905		18.3N 121.7E	98231
18	061100	18.6N 122.2E	LAND				10411 42801		18.3N 121.7E	98231
19	061130	18.6N 122.1E	LAND				10411 42702		18.3N 121.7E	98231
20	061230	18.7N 121.9E	LAND				10317 42805		18.3N 121.7E	98231
21	061300	18.7N 121.8E	LAND				///// 42901		18.3N 121.7E	98231
22	061430	18.7N 121.6E	LAND				10311 42704	EYE 65 PCT CIR	18.3N 121.7E	98231
23	061500	18.9N 121.5E	LAND				10371 43404	EYE 85 PCT CIR	18.3N 121.7E	98231
24	061930	19.1N 120.7E	LAND				10691 42905	EYE 60 PCT CIR DIA 30 KMS	18.3N 121.7E	98231
25	062000	19.1N 120.7E	LAND				10281 40000	EYE 65 PCT CIR DIA 10 KMS	18.3N 121.7E	98231
26	062100	19.2N 120.7E	LAND				11461 43204	EYE 55 PCT ELPTCL DIA 20 KMS	18.3N 121.7E	98231
27	062230	19.3N 120.3E	LAND				4//// 42903		16.3N 120.6E	98321
28	062300	19.3N 120.3E	LAND				11841 52705	EYE 50 PCT ELPTCL DIA 25 KMS	18.3N 121.7E	98231
29	062300	19.2N 120.4E	LAND				4//// 42904		16.3N 120.6E	98321
30	070140	19.4N 119.9E	LAND				11481 43003	EYE 40 PCT ELPTCL DIA 25 KMS	18.3N 121.7E	98231
31	070200	19.6N 119.5E	LAND				10613 43206		16.3N 120.6E	98321
32	070230	19.6N 119.4E	LAND				10613 43207	EYE 50 PCT CIR OPEN SW DIA 35 K	16.3N 120.6E	98321
33	070240	19.4N 119.7E	LAND				11471 42903	EYE 30 PCT DIA 25 KMS	18.3N 121.7E	98231
34	070300	19.5N 119.6E	LAND				11181 33310	EYE 35 PCT ELPTCL DIA 20-25 KMS	18.3N 121.7E	98231
35	070650	20.4N 119.3E	LAND				6///3 53011		23.3N 116.7E	59316
36	070700	19.7N 118.9E	LAND				5//// 53003		18.3N 121.7E	98231
37	071200	19.6N 118.2E	LAND				4//// 52707		22.6N 120.3E	46744
38	080200	20.8N 116.7E	LAND				6///2 /2808		22.3N 114.2E	45005
39	080400	20.8N 116.0E	LAND				30973 53109		22.3N 114.2E	45005
40	080500	20.8N 116.0E	LAND				30913 63106		22.3N 114.2E	45005
41	080800	21.0N 115.5E	LAND				30943 73108		22.3N 114.2E	45005
42	080900	21.0N 115.4E	LAND				10382 73009		22.3N 114.2E	45005
43	081000	21.0N 115.3E	LAND				10382 73009		22.3N 114.2E	45005
44	081100	21.2N 115.3E	LAND				3//// 73005		22.3N 114.2E	45005
45	081150	21.1N 115.2E	LAND				24934 53010		23.3N 116.7E	59316
46	081200	21.3N 115.0E	LAND				30111 73008		22.3N 114.2E	45005
47	081400	21.5N 114.9E	LAND				2//// 73010		22.3N 114.2E	45005
48	081500	21.5N 114.6E	LAND				2//// 73010		22.3N 114.2E	45005
49	081600	21.6N 114.5E	LAND				2//// 73010		22.3N 114.2E	45005
50	081700	21.6N 114.4E	LAND				2//// 73010		22.3N 114.2E	45005
51	081900	21.7N 114.0E	LAND				2020/ 72911		22.3N 114.2E	45005

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	081800	21.7N 114.3E	070	040	WMO 45005
2	082100	22.0N 113.7E	070	020	WMO 45011, 45005
3	090000	22.2N 113.4E	065	005	WMO 45011

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

SUPER TYPHOON FORREST
BEST TRACK DATA

	BEST TRACK			WARNING				24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
092012Z	10.3	144.1	30	10.3	143.9	30.	12.	0.	12.2	140.2	35.	92.	-25.	13.7	137.2	50.	221.	-70.	15.2	134.4	65.	314.	-70.
092018Z	11.0	143.2	40	11.2	143.0	40.	17.	0.	13.2	139.3	75.	76.	10.	15.0	135.5	90.	197.	-50.	16.3	131.6	100.	242.	-30.
092100Z	12.1	141.9	50	12.0	142.0	60.	8.	10.	14.2	138.1	90.	61.	25.	6.2	134.0	100.	147.	-50.	17.5	129.6	110.	201.	-20.
092106Z	12.8	140.9	55	12.7	141.0	65.	8.	10.	15.0	136.5	90.	76.	-5.	16.7	132.4	100.	144.	-45.	17.7	128.2	110.	241.	-15.
092112Z	13.7	139.9	60	13.6	139.9	65.	6.	5.	15.6	136.2	85.	97.	-35.	17.4	132.7	90.	153.	-45.	18.9	129.2	100.	202.	-20.
092118Z	14.4	138.9	65	14.4	139.0	65.	6.	0.	16.5	135.5	80.	112.	-60.	18.3	132.3	90.	138.	-40.	19.4	129.8	95.	238.	-25.
092200Z	15.2	137.9	65	15.1	138.1	65.	13.	0.	17.7	134.6	85.	83.	-65.	19.5	130.8	95.	85.	-35.	20.6	127.2	105.	192.	-15.
092206Z	16.2	136.9	95	16.0	137.0	70.	13.	-25.	19.0	133.0	90.	35.	-55.	21.1	129.5	100.	25.	-25.	23.1	125.8	110.	94.	-15.
092212Z	17.2	136.0	120	17.4	136.1	115.	13.	-5.	19.3	133.0	140.	74.	5.	21.4	130.3	135.	111.	15.	22.8	128.5	130.	174.	10.
092218Z	18.2	134.7	140	18.1	134.7	130.	6.	-10.	20.8	131.0	140.	31.	10.	23.2	128.8	135.	46.	15.	25.1	127.3	130.	91.	10.
092300Z	18.6	133.5	150	18.7	133.6	140.	8.	-10.	21.2	129.7	135.	37.	5.	23.7	127.5	135.	13.	15.	26.1	127.2	130.	125.	15.
092306Z	19.1	132.4	145	19.2	132.6	145.	13.	0.	21.7	128.9	140.	41.	15.	24.5	127.2	135.	20.	10.	26.9	127.4	130.	172.	15.
092312Z	19.8	131.8	135	19.5	131.9	135.	19.	0.	21.5	128.4	125.	42.	5.	24.2	126.8	115.	50.	-5.	27.5	126.9	105.	159.	-5.
092318Z	20.3	131.1	130	20.0	130.9	135.	21.	5.	22.2	127.7	125.	51.	5.	25.2	126.8	115.	65.	-5.	28.5	127.4	105.	188.	0.
092400Z	20.8	130.2	130	20.8	130.3	125.	6.	-5.	24.0	128.2	110.	51.	-10.	27.0	128.8	100.	204.	-15.	30.8	131.5	90.	395.	-5.
092406Z	21.5	129.6	125	21.5	129.8	120.	11.	-5.	24.7	128.3	110.	80.	-15.	27.9	128.8	95.	239.	-20.	31.6	132.3	80.	402.	-5.
092412Z	22.2	128.5	120	22.2	128.6	120.	6.	0.	26.2	127.5	110.	102.	-10.	30.8	130.4	90.	369.	-20.	35.9	143.1	60.	930.	-20.
092418Z	23.0	128.0	120	22.9	127.8	115.	13.	-5.	27.0	127.8	100.	129.	-20.	31.6	131.5	80.	421.	-25.	36.0	145.7	50.	953.	-20.
092500Z	23.8	127.3	120	23.7	127.4	120.	8.	0.	27.9	127.5	110.	149.	-5.	33.9	136.2	80.	673.	-15.	37.5	150.7	50.	1091.	-15.
092506Z	24.3	126.9	125	24.3	126.9	115.	0.	-10.	28.1	127.0	100.	145.	-15.	33.8	135.9	80.	609.	-5.	37.5	150.4	50.	907.	0.
092512Z	24.9	126.3	120	25.1	126.4	115.	13.	-5.	28.8	126.8	105.	152.	-5.	33.9	136.2	80.	571.	0.	0.0	0.0	0.	-0.	0.
092518Z	25.8	125.8	120	25.7	125.8	115.	6.	-5.	29.3	125.8	100.	100.	-5.	33.7	135.8	80.	449.	10.	0.0	0.0	0.	-0.	0.
092600Z	26.8	125.0	115	27.0	125.0	115.	12.	0.	30.2	125.0	100.	63.	5.	33.5	127.5	90.	98.	25.	0.0	0.0	0.	-0.	0.
092606Z	27.7	124.3	115	27.5	124.5	115.	16.	0.	31.3	123.5	100.	78.	15.	34.3	126.6	85.	323.	35.	0.0	0.0	0.	-0.	0.
092612Z	28.2	124.0	110	28.2	124.0	115.	0.	5.	31.5	123.7	100.	99.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092618Z	29.1	123.9	105	29.1	124.0	110.	5.	5.	33.1	126.5	85.	86.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092700Z	29.6	124.0	95	29.8	124.0	100.	12.	5.	32.2	124.7	85.	230.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092706Z	30.4	124.6	85	30.5	124.4	90.	12.	5.	33.1	126.2	80.	333.	30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092712Z	30.9	125.5	80	31.0	125.7	85.	12.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092718Z	31.8	127.2	70	31.5	126.8	85.	27.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092800Z	32.7	129.2	65	32.6	129.3	65.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092806Z	32.8	132.8	50	32.9	132.8	50.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	11.	97.	224.	366.	10.	97.	224.	366.
AVG RIGHT ANGLE ERROR	8.	64.	79.	118.	8.	64.	79.	118.
AVG INTENSITY MAGNITUDE ERROR	5.	18.	25.	17.	5.	18.	25.	17.
AVG INTENSITY BIAS	-0.	-5.	-14.	-12.	-0.	-5.	-14.	-12.
NUMBER OF FORECASTS	32	28	24	20	31	28	24	20

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2191. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 12. KNOTS

SUPER TYPHOON FORREST
FIX POSITIONS FOR CYCLONE NO. 11

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	170000	7.3N 162.7E	PCN 6	T0.0/0.0		PGTW
2	170300	8.0N 160.6E	PCN 6			PGTW
3	170600	6.0N 161.0E	PCN 6			PGTW
4	170900	5.6N 161.6E	PCN 6			PGTW
5	171200	5.4N 161.9E	PCN 6			PGTW
6	171600	5.4N 159.4E	PCN 6			PGTW
7	171800	5.6N 158.9E	PCN 6			PGTW
8	172100	6.2N 158.5E	PCN 6			PGTW
9	180000	6.2N 158.1E	PCN 6	T0.0/0.0 /S0.0/24HRS		PGTW
10	180300	5.4N 157.6E	PCN 6			PGTW
11	180600	5.3N 156.8E	PCN 6			PGTW
12	180900	5.2N 156.0E	PCN 6			PGTW
13	181200	5.2N 155.3E	PCN 6	T1.5/1.5	INIT OBS	PGTW
14	181600	5.1N 154.3E	PCN 6		ULCC FIX	PGTW
15	181800	5.5N 153.7E	PCN 6			PGTW
16	182100	5.9N 152.6E	PCN 5			PGTW
17	190000	6.0N 152.5E	PCN 6	T2.0/2.0-/D2.0/12HRS	ULCC FIX	PGTW
18	190300	6.3N 151.9E	PCN 6		ULCC FIX	PGTW
19	190600	6.4N 151.3E	PCN 6		ULCC FIX	PGTW
20	190853	6.0N 150.7E	PCN 5		ULCC FIX	PGTW
21	191627	8.7N 148.3E	PCN 6	T2.0/2.0 /D0.5/16HRS		PGTW
22	191951	9.3N 147.9E	PCN 6		ULCC FIX	PGTW
23	192147	9.4N 146.9E	PCN 5			PGTW

24	200000	9.5N	146.3E	PCN 6	T2.5/2.5 /D0.5/09HRS		PGTW
25	200300	9.7N	145.6E	PCN 6			PGTW
26	200600	10.2N	144.8E	PCN 6			PGTW
27	200832	10.1N	144.4E	PCN 6			PGTW
28	201027	10.3N	144.1E	PCN 6			PGTW
29	201200	10.2N	144.0E	PCN 6	T3.0/3.0 /D1.0/12HRS		PGTW
30	201600	10.7N	143.6E	PCN 6			PGTW
31	201800	11.1N	143.6E	PCN 6			PGTW
32	202100	11.8N	142.5E	PCN 6			PGTW
33	202111	11.8N	142.7E	PCN 6			PGTW
34	202112	11.7N	143.0E	PCN 5	T3.0/3.0	INIT OBS	RPMK
35	210000	11.9N	141.9E	PCN 6			PGTW
36	210300	12.4N	141.4E	PCN 4	T3.5/3.5 /D1.0/15HRS		PGTW
37	210530	12.8N	141.0E	PCN 4			PGTW
38	210900	13.3N	140.5E	PCN 4			PGTW
39	211005	13.5N	140.3E	PCN 4			PGTW
40	211200	13.3N	139.9E	PCN 6	T4.0/4.0 /D1.0/12HRS		PGTW
41	211600	14.2N	139.6E	PCN 6			PGTW
42	211800	14.4N	139.0E	PCN 6			PGTW
43	212050	14.6N	138.5E	PCN 3			PGTW
44	212245	14.8N	138.2E	PCN 3			PGTW
45	212245	15.1N	138.3E	PCN 3	T4.5/4.5 /D1.5/25HRS		RPMK
46	220000	15.3N	138.1E	PCN 4	T4.0/4.0 /D0.5/12HRS		PGTW
47	220300	15.8N	137.6E	PCN 4			PGTW
48	220517	16.8N	136.6E	PCN 3	T4.5/4.5	INIT OBS	RODN
49	220600	16.3N	137.0E	PCN 2			PGTW
50	220900	17.0N	136.7E	PCN 2			PGTW
51	220944	17.0N	136.4E	PCN 2			PGTW
52	221200	17.4N	136.1E	PCN 2	T5.0/5.0 /D1.0/12HRS		PGTW
53	221600	17.9N	135.0E	PCN 2			PGTW
54	221800	18.1N	134.7E	PCN 2			PGTW
55	222030	18.4N	134.1E	PCN 1			PGTW
56	222223	18.5N	133.9E	PCN 1			PGTW
57	230000	18.5N	133.6E	PCN 2	T5.5/5.5 /D1.5/12HRS		PGTW
58	230300	18.9N	133.0E	PCN 2			PGTW
59	230600	19.2N	132.6E	PCN 2			PGTW
60	230646	19.2N	132.8E	PCN 3	T5.5/5.5 /D1.0/26HRS		RODN
61	230647	19.0N	132.7E	PCN 1			PGTW
62	230910	19.3N	132.0E	PCN 2			PGTW
63	231103	19.4N	132.2E	PCN 1			RPMK
64	231200	19.5N	131.8E	PCN 2	T5.5/5.5-/D0.5/12HRS		PGTW
65	231600	19.8N	131.2E	PCN 2			PGTW
66	231800	19.9N	130.9E	PCN 2			PGTW
67	232100	20.3N	130.7E	PCN 2			PGTW
68	232150	20.6N	130.6E	PCN 1			PGTW
69	232150	20.6N	130.8E	PCN 1	T6.5/6.5	INIT OBS	RPMK
70	232342	20.8N	130.4E	PCN 2	T5.5/5.5 /S0.0/12HRS		PGTW
71	240000	20.7N	130.3E	PCN 2			PGTW
72	240300	21.1N	130.0E	PCN 2			PGTW
73	240600	21.5N	129.7E	PCN 2			PGTW
74	240634	21.6N	129.5E	PCN 2			PGTW
75	241041	22.2N	128.8E	PCN 1			PGTW
76	241041	22.1N	128.8E	PCN 1	T6.5/6.5	INIT OBS	RPMK
77	241200	22.4N	128.7E	PCN 2	T5.0/5.5 /W0.5/12HRS		PGTW
78	241600	22.6N	128.4E	PCN 4			PGTW
79	241800	22.9N	128.0E	PCN 4			PGTW
80	242100	23.3N	127.9E	PCN 4			PGTW
81	242129	23.5N	127.9E	PCN 3		EYE OPEN SSW-SE	PGTW
82	242129	23.4N	128.0E	PCN 1	T6.0/6.5 /W0.5/24HRS		RPMK
83	242321	23.6N	127.3E	PCN 1	T5.5/5.5-/S0.0/12HRS		PGTW
84	242321	23.6N	127.4E	PCN 1	T5.0/5.0	INIT OBS	RODN
85	250300	24.2N	127.2E	PCN 2			PGTW
86	250600	24.4N	126.8E	PCN 2			PGTW
87	250622	24.3N	126.8E	PCN 1			PGTW
88	250900	24.8N	127.0E	PCN 2			PGTW
89	251000	24.8N	126.7E	PCN 2			PGTW
90	251019	24.8N	126.7E	PCN 2			PGTW
91	251200	25.2N	126.4E	PCN 2	T5.0/5.0-/S0.0/12HRS		PGTW
92	251600	25.4N	125.9E	PCN 2			PGTW
93	251800	25.7N	125.9E	PCN 2			PGTW
94	252100	26.2N	125.8E	PCN 2			PGTW
95	252107	26.4N	125.6E	PCN 1			PGTW
96	252259	26.6N	124.9E	PCN 1	T6.0/6.0 /S0.0/25HRS		RPMK
97	252259	26.6N	125.1E	PCN 1	T5.5/5.5 /S0.0/11HRS		PGTW
98	260000	26.8N	125.1E	PCN 2			PGTW
99	260300	27.4N	124.7E	PCN 2			PGTW
100	260600	27.6N	124.4E	PCN 2			PGTW
101	260610	27.5N	124.5E	PCN 1			PGTW
102	260900	27.9N	124.3E	PCN 2		EYE DIA 25NM	PGTW
103	260948	27.9N	124.2E	PCN 2			PGTW
104	261200	28.2N	124.1E	PCN 2		EYE DIA 25NM	PGTW
105	261600	28.7N	124.0E	PCN 2	T5.0/5.0-/S0.0/17HRS		PGTW
106	261800	29.1N	124.0E	PCN 2			PGTW
107	262047	29.4N	123.8E	PCN 3			PGTW
108	270000	29.6N	123.9E	PCN 4	T4.0/5.0 /W1.5/08HRS		PGTW
109	270019	30.0N	124.2E	PCN 3	T4.5/5.5-/W1.5/25HRS		RPMK
110	270300	29.9N	124.1E	PCN 4			PGTW
111	270557	30.3N	124.6E	PCN 3			PGTW
112	270900	30.7N	124.8E	PCN 4			PGTW
113	271100	31.0N	125.4E	PCN 5			RODN
114	271100	31.3N	127.1E	PCN 5			RKSO
115	271200	30.8N	125.7E	PCN 6			PGTW

116	271600	31.3N 126.5E	PCN 6	T2.5/3.5 /W1.5/16HRS		PGTW
117	272025	32.4N 128.5E	PCN 5			RODN
118	272100	32.5N 127.5E	PCN 6		ULCC FIX	PGTW
119	272357	32.6N 129.2E	PCN 3	T3.0/3.0	INIT OBS	RKSO
120	280000	32.6N 129.4E	PCN 4	T3.0/4.0 /W1.5/08HRS		PGTW
121	280300	32.9N 130.8E	PCN 6			PGTW
122	280545	33.0N 132.3E	PCN 5			PGTW
123	280905	33.6N 135.7E	PCN 6			PGTW
124	281200	35.2N 137.8E	PCN 6			PGTW
125	281600	35.0N 140.4E	PCN 6			PGTW
126	281800	35.7N 142.3E	PCN 6			PGTW
127	282355	35.3N 143.7E	PCN 5	T2.0/3.0 /W1.0/24HRS		RKSO

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	202337	12.0N 142.0E	700MB	3032	994	65 160 70	120 61 030 61	8 2			+13 + 7	5
2	210252	12.2N 141.4E	700MB	3013		55 050 25	120 44 050 30	6 2			+12 + 9	5
3	210544	12.7N 141.0E	700MB	2981		40 360 30	090 49 360 30	5 2			+14	6
4	210839	13.2N 140.4E	700MB	2984	987	60 110 40	220 54 130 70	5 3	ELLIPTICAL	35 20 020	+12 +15 +15	6
5	212127	14.9N 138.3E	700MB	2880		65 330 20	200 55 130 120	15 2	CIRCULAR	06	+12 +15 +11	7
6	212340	15.1N 138.1E	700MB	2865	975	80 360 30	130 70 360 20	10 2	CIRCULAR	10	+10 +16 +11	7
7	221057	17.0N 136.2E	700MB	2468	926		090 90 340 30	12 1	CIRCULAR	5	+13 +25 +13	8
8	221345	17.5N 135.7E	700MB	2285			160 105 090 10	12 1				8
9	222030	18.4N 134.2E	700MB	2009		70 310 90	230 90 120 10	3 1	CIRCULAR	5	+14 +27 +15	9
10	222307	18.5N 133.7E	700MB	2068	883	130 210 10	260 94 210 25	3 1	CIRCULAR	5	+15 +27 +17	9
11	230912	19.3N 132.1E	700MB	2189	898	65 120 02	190 96 100 17	8 3	CIRCULAR	6	+15 +19 +18	11
12	231139	19.5N 132.0E	700MB	2235	902		120 96 020 21	8 3	CIRCULAR	7	+13 +19 +18	11
13	232044	20.5N 130.9E	700MB	2314		100 360 30	110 110 360 30	15 1	ELLIPTICAL	8 4 090	+16 +20 +13	12
14	232312	20.8N 130.3E	700MB	2315	911	120 230 30	040 86 320 60	6 1	CONCENTRIC	20 8	+15 +19 +16	12
15	240835	21.9N 129.2E	700MB	2376		100 120 22	149 105 040 40	3 1	ELLIPTICAL	8 4 150	+16 +19 +16	13
16	241104	22.2N 128.7E	700MB	2383	919		040 99 320 45	5 2	ELLIPTICAL	8 4 110	+16 +19 +16	13
17	242032	23.4N 127.8E	700MB	2377	917	80 010 90	170 110 100 80	7 3	CIRCULAR	5	+17 +21 +19	14
18	242312	23.7N 127.4E	700MB	2393	918	80 210 90	030 95 290 41	7 3	CIRCULAR	6	+14 +21 +20	14
19	250830	24.8N 126.8E	700MB	2302	909		190 101 130 97	4 2	CIRCULAR	20	+13 +20 +17	15
20	251114	24.8N 126.5E	700MB	2392	918		350 89 260 40	4 2	ELLIPTICAL	40 30 360	+19 +22 +15	15
21	252036	26.3N 125.6E	700MB	2400		90 070 120	160 110 070 120	12 1	ELLIPTICAL	30 20 170	+16 +21 +19	16
22	252335	26.8N 125.1E	700MB	2433	924	130 230 10	110 91 030 30	9 1	CIRCULAR	10	+16 +20 +19	16
23	260841	27.8N 124.3E	700MB	2460	926	100 090 80	180 98 090 80	5 3	CIRCULAR	25	+15 +20 +14	17
24	272350	32.7N 129.2E	700MB	2894	976	50 230 60	310 58 240 100	5 5	CIRCULAR	40	+15 +16 +12	18

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	241900	23.3N 128.0E	LAND	FAIR		70		MVG 34/30	26.1N 127.7E	47937
2	242000	23.3N 127.8E	LAND	FAIR		60		MVG 32/20	26.1N 127.7E	47937
3	242100	23.4N 127.8E	LAND	GOOD		50		MVG 33/20	26.1N 127.7E	47937
4	242200	23.5N 127.6E	LAND	GOOD		50		MVG 33/20	26.1N 127.7E	47937
5	242300	23.7N 127.5E	LAND	GOOD		55		MVG 33/20	26.1N 127.7E	47937
6	250000	23.7N 127.4E	LAND	GOOD		50		MVG 33/20	24.8N 125.3E	47927
7	250100	23.8N 127.3E	LAND	GOOD		40		MVG 33/10	24.8N 125.3E	47927
8	250135	24.1N 127.4E	LAND	POOR				MVG 31/15	26.4N 127.8E	47931
9	250200	23.9N 127.3E	LAND	GOOD		40		MVG 33/20	24.8N 125.3E	47927
10	250235	24.2N 127.3E	LAND	POOR					26.4N 127.8E	47931
11	250300	24.0N 127.2E	LAND	GOOD		50		MVG 33/20	24.8N 125.3E	47927
12	250400	24.2N 127.1E	LAND	GOOD		60		MVG 35/20	26.1N 127.7E	47937
13	250500	24.2N 127.0E	LAND	GOOD		50		MVG 31/20	26.1N 127.7E	47937
14	250535	24.2N 127.1E	LAND	FAIR	ELLIPTICAL			AXIS 40/25	26.4N 127.8E	47931
15	250600	24.2N 126.9E	LAND				45//3 52911		24.8N 125.3E	47927
16	250600	24.3N 126.9E	LAND				11983 73208		26.1N 127.7E	47937
17	250600	24.3N 126.9E	LAND	GOOD		50		MVG 31/20	26.1N 127.7E	47937
18	250700	24.4N 126.8E	LAND	GOOD		55		MVG 33/20	26.1N 127.7E	47937
19	250735	24.8N 127.2E	LAND	POOR					26.4N 127.8E	47931
20	250800	24.7N 126.9E	LAND	GOOD		55		MVG 36/30	26.1N 127.7E	47937
21	250810	24.5N 126.8E	LAND	FAIR					26.4N 127.8E	47931
22	250835	24.8N 127.0E	LAND	FAIR	ELLIPTICAL			AXIS 35/20	26.4N 127.8E	47931
23	250900	24.8N 126.8E	LAND	GOOD		55		MVG 33/30	26.1N 127.7E	47937
24	250930	24.8N 126.7E	LAND	FAIR	ELLIPTICAL			AXIS 35/25	26.4N 127.8E	47931
25	251030	24.9N 126.6E	LAND	GOOD	ELLIPTICAL			AXIS 30/25	26.4N 127.8E	47931
26	251100	25.0N 126.5E	LAND	GOOD		55		MVG 32/10	26.1N 127.7E	47937
27	251130	24.9N 126.4E	LAND	GOOD	ELLIPTICAL			AXIS 55/45	26.4N 127.8E	47931
28	251230	25.1N 126.3E	LAND	GOOD	ELLIPTICAL			AXIS 50/40	26.4N 127.8E	47931
29	251300	25.1N 126.2E	LAND	GOOD		50		MVG 30/15	26.1N 127.7E	47937
30	251335	25.1N 126.2E	LAND	GOOD	ELLIPTICAL			AXIS 30/20	26.4N 127.8E	47931
31	251400	25.2N 126.2E	LAND	GOOD		50		MVG 33/20	26.1N 127.7E	47937
32	251435	25.2N 126.2E	LAND	GOOD	ELLIPTICAL			AXIS 30/25	26.4N 127.8E	47931
33	251600	25.5N 125.9E	LAND	GOOD		55		MVG 33/20	26.1N 127.7E	47937
34	251630	25.3N 126.2E	LAND	GOOD	ELLIPTICAL			AXIS 30/25	26.4N 127.8E	47931
35	251635	25.5N 126.1E	LAND	FAIR					26.4N 127.8E	47931
36	251700	25.6N 125.8E	LAND	GOOD		50		MVG 32/20	26.1N 127.7E	47937
37	251735	25.6N 125.9E	LAND	POOR					26.4N 127.8E	47931

38	251800	25.7N 125.8E	LAND	GOOD		60		MVG 35/10	26.1N 127.7E	47937
39	251835	25.8N 125.8E	LAND	FAIR					26.4N 127.8E	47931
40	251900	25.8N 125.8E	LAND	GOOD		60		MVG 36/20	26.1N 127.7E	47937
41	251935	25.8N 125.9E	LAND	POOR					26.4N 127.8E	47931
42	252000	26.1N 125.8E	LAND	GOOD		40		MVG 36/40	26.1N 127.7E	47937
43	252030	26.2N 125.8E	LAND	FAIR	CONCENTRIC	20			26.4N 127.8E	47931
44	252100	26.3N 125.7E	LAND	GOOD		20		MVG 32/30	26.1N 127.7E	47937
45	252200	26.7N 125.5E	LAND	GOOD		40		MVG 33/40	26.1N 127.7E	47937
46	260000	26.8N 125.1E	LAND	GOOD		40		MVG 32/25	26.1N 127.7E	47937
47	260100	26.8N 125.0E	LAND	GOOD		40		MVG 29/10	26.1N 127.7E	47937
48	260200	27.0N 124.8E	LAND	GOOD		40		MVG 31/30	26.3N 126.8E	47929
49	260300	27.2N 124.7E	LAND	GOOD		40		MVG 32/30	26.3N 126.8E	47929
50	260400	27.3N 124.6E	LAND				35/44 53206		24.8N 125.3E	47927
51	260400	27.2N 124.7E	LAND	GOOD		35		MVG 36/20	26.3N 126.8E	47929
52	260500	27.3N 124.4E	LAND				20874 52815		24.8N 125.3E	47927
53	260500	27.4N 124.5E	LAND	GOOD		30		MVG 33/20	26.3N 126.8E	47929
54	260600	27.4N 124.4E	LAND				21815 53600		24.8N 125.3E	47927
55	260600	27.5N 124.4E	LAND	FAIR		40		MVG 33/20	26.3N 126.8E	47929
56	260700	27.6N 124.3E	LAND				20815 53411		24.8N 125.3E	47927
57	260700	27.5N 124.5E	LAND				6///3 83308		26.1N 127.7E	47937
58	260700	27.6N 124.4E	LAND	FAIR		30		MVG 34/20	26.3N 126.8E	47929
59	260800	27.8N 124.2E	LAND				6///5 53411		24.8N 125.3E	47927
60	260800	27.7N 124.3E	LAND	GOOD		25		MVG 33/20	26.3N 126.8E	47929
61	260900	27.8N 124.3E	LAND	GOOD		20		MVG 35/20	26.3N 126.8E	47929
62	261000	27.9N 124.2E	LAND	GOOD		25		MVG 30/20	26.3N 126.8E	47929
63	261100	28.0N 124.1E	LAND	GOOD		20		MVG 31/20	26.3N 126.8E	47929
64	261300	28.2N 124.1E	LAND	GOOD		20		MVG 34/20	26.3N 126.8E	47929
65	261400	28.3N 124.0E	LAND	POOR		20		MVG 34/15	26.3N 126.8E	47929
66	280010	32.7N 129.3E	LAND	GOOD		25		MVG 09/30	32.7N 128.8E	47844

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	280000	32.6N 129.3E	065	030	WMO 47843
2	280300	32.7N 131.3E	055	020	WMO 47821
3	280600	32.9N 132.8E	050	020	WMO 47898
4	281200	34.7N 136.6E	040	012	WMO 47665, 47654, 47651,47778, 47771
5	281500	33.9N 139.4E	040	050	WMO 47670, 47675

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM GEORGIA
BEST TRACK DATA

	BEST TRACK			WARNING				24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS				ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
092800Z	17.2	118.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092806Z	17.9	117.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092812Z	18.8	116.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092818Z	19.2	115.7	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092900Z	19.2	114.8	40	19.3	114.9	50.	8.	10.	20.0	111.4	65.	33.	15.	20.4	107.7	60.	52.	5.	0.0	0.0	0.	-0.	0.
092906Z	19.2	113.8	55	19.3	113.8	55.	6.	0.	19.9	109.4	60.	31.	10.	20.8	105.8	50.	25.	10.	0.0	0.0	0.	-0.	0.
092912Z	19.3	112.5	55	19.3	112.3	50.	11.	-5.	20.1	107.8	50.	73.	5.	22.0	104.7	40.	78.	10.	0.0	0.0	0.	-0.	0.
092918Z	19.3	111.9	50	19.3	111.6	50.	17.	0.	19.8	108.4	50.	29.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
093000Z	19.6	111.0	50	19.4	110.8	50.	16.	0.	20.1	107.4	45.	34.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
093006Z	20.1	109.9	50	19.7	110.0	45.	25.	-5.	20.6	106.7	45.	68.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
093012Z	20.2	109.1	45	20.2	109.0	45.	6.	0.	21.8	106.0	45.	102.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
093018Z	20.2	108.1	45	20.2	108.1	45.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100100Z	20.2	106.8	55	20.2	107.1	45.	17.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100106Z	20.5	105.5	40	20.5	105.5	40.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100112Z	20.7	104.6	30	20.7	104.6	40.	0.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	10.	53.	52.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	7.	27.	18.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	4.	9.	8.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	0.	6.	8.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	11	7	3	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 825. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 10. KNOTS

TROPICAL STORM GEORGIA
FIX POSITIONS FOR CYCLONE NO. 12

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	280000	17.3N 118.0E	PCN 6	T1.0/1.0	INIT OBS	PGTW
2	280300	17.7N 117.5E	PCN 6			PGTW
3	280600	18.0N 117.2E	PCN 6			PGTW
4	280727	18.4N 116.7E	PCN 5	T1.5/1.5	INIT OBS	RPMK
5	280900	18.4N 116.9E	PCN 6			PGTW
6	281200	18.8N 116.6E	PCN 6	T1.5/1.5	INIT OBS	PGTW
7	281600	19.4N 116.3E	PCN 6			PGTW
8	281800	19.4N 114.8E	PCN 6		ULCC FIX	PGTW
9	282100	19.3N 114.5E	PCN 6			PGTW
10	282146	19.5N 115.1E	PCN 5			PGTW
11	282146	19.2N 114.5E	PCN 5			RPMK
12	290000	19.0N 114.8E	PCN 6	T3.0/3.0 /D2.0/24HRS		PGTW
13	290300	19.3N 114.5E	PCN 6			PGTW
14	290600	19.2N 113.8E	PCN 6			PGTW
15	290714	19.2N 113.8E	PCN 5	T3.5/3.5 /D2.0/24HRS		RPMK
16	290900	19.4N 112.8E	PCN 6			PGTW
17	291026	19.2N 112.5E	PCN 3			PGTW
18	291200	19.4N 112.3E	PCN 6	T3.0/3.0 /D1.5/24HRS		PGTW
19	291214	19.1N 111.8E	PCN 3			RODN
20	291215	18.9N 112.8E	PCN 5			RPMK
21	291600	19.1N 112.0E	PCN 6			PGTW
22	291800	19.1N 111.7E	PCN 6			PGTW
23	292100	19.1N 111.5E	PCN 6			PGTW
24	300000	19.1N 110.9E	PCN 6			PGTW
2[illegible]	300054	19.6N 111.9E	PCN 3	T3.0/3.0	INIT OBS	RODN
2[illegible]	[illegible]00300	19.7N 110.5E	PCN 6		ULCC FIX	PGTW
2[illegible]	300600	20.2N 109.8E	PCN 6	T3.5/3.5-/D0.5/30HRS		PGTW
28	300900	20.4N 109.6E	PCN 6		ULCC FIX	PGTW
29	301153	20.1N 109.1E	PCN 4			RODN
30	301200	20.4N 109.0E	PCN 6			PGTW
31	301600	19.9N 108.3E	PCN 6	T3.0/3.0-/S0.0/24HRS		PGTW
32	301800	20.1N 108.1E	PCN 4			PGTW
33	301947	19.8N 107.6E	PCN 5			RODN
34	302100	20.1N 107.7E	PCN 4			PGTW
35	302234	20.2N 107.5E	PCN 4			RODN
36	010000	20.4N 106.8E	PCN 4	T4.0/4.0-/D0.5/18HRS		PGTW
37	010033	20.3N 106.3E	PCN 3	T3.0/3.0 /S0.0/24HRS		RODN

38	010300	20.4N 106.1E	PCN 4		PGTW
39	010600	20.5N 105.5E	PCN 4	T3.0/3.5-/W0.5/24HRS	PGTW
40	011124	20.5N 104.7E	PCN 4		RODN
41	011131	20.6N 104.2E	PCN 5		RPMK
42	011200	20.7N 104.6E	PCN 6		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	290033	19.2N 114.9E	1500FT		996	55 030 20	140 69 030 20	7 5			+26 +27 +24 32	1

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	290900	19.5N 113.0E	LAND				6//// /////		22.3N 114.2E	45005
2	291500	19.5N 112.4E	LAND				6//// /////		22.3N 114.2E	45005
3	301100	19.8N 110.3E	LAND				1103/ 3////		16.3N 120.6E	98321

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM HERBERT
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
100612Z	10.8	115.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100618Z	11.0	114.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100700Z	11.4	113.8	35	11.3	113.8	35.	6.	0.	11.8	111.2	45.	34.	0.	12.3	108.8	35.	43.	-5.	0.0	0.0	0.	-0.	0.
100706Z	11.5	113.0	40	11.4	113.0	40.	6.	0.	12.0	110.1	45.	30.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100712Z	11.7	112.2	40	11.8	111.8	40.	24.	0.	12.2	108.8	40.	43.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100718Z	11.8	111.5	40	11.9	111.0	40.	30.	0.	12.8	108.3	35.	29.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100800Z	12.2	110.8	45	12.2	110.4	50.	23.	5.	12.7	107.9	30.	32.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100806Z	12.5	110.1	50	12.8	110.3	50.	21.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100812Z	12.6	109.4	50	12.9	109.5	45.	19.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100818Z	12.8	108.8	45	12.8	108.5	40.	18.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100900Z	12.9	108.4	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	18.	33.	43.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	11.	24.	29.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	2.	7.	5.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-1.	-7.	-5.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	8	5	1	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 445. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 7. KNOTS

TROPICAL STORM HERBERT
FIX POSITIONS FOR CYCLONE NO. 13

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	041800	7.1N 121.8E	PCN 6			PGTW
2	042100	7.2N 120.6E	PCN 6			PGTW
3	050000	7.4N 119.9E	PCN 6			PGTW
4	050400	7.8N 119.4E	PCN 6	T1.0/1.0	INIT OBS	PGTW
5	051600	10.0N 118.5E	PCN 6	T1.0/1.0	INIT OBS	PGTW
6	051800	10.1N 118.1E	PCN 6			PGTW
7	052100	10.4N 117.2E	PCN 6			PGTW
8	060000	10.7N 115.4E	PCN 6		ULCC FIX	PGTW
9	060400	10.8N 114.9E	PCN 6	T2.0/2.0 /D1.0/24HRS	ULCC FIX	PGTW
10	060600	10.7N 114.2E	PCN 6		ULCC FIX	PGTW
11	060730	11.0N 115.0E	PCN 3	T1.5/1.5	INIT OBS	RPMK
12	060900	10.9N 115.2E	PCN 6		ULCC FIX	PGTW
13	061123	11.1N 114.9E	PCN 6		ULCC FIX	PGTW
14	061200	11.2N 114.9E	PCN 6			PGTW
15	061600	11.3N 114.2E	PCN 6	T2.0/2.0 /D1.0/24HRS		PGTW
16	061800	11.6N 113.7E	PCN 6			PGTW
* 17	062100	11.9N 113.2E	PCN 6			PGTW
18	062219	12.0N 114.2E	PCN 5	T2.0/2.0 /D0.5/15HRS		RPMK
19	070000	11.5N 113.2E	PCN 6			PGTW
20	070003	11.9N 113.0E	PCN 5	T1.0/1.0	INIT OBS	RODN
21	070400	11.4N 113.1E	PCN 4	T2.5/2.5 /D0.5/24HRS		PGTW
22	070600	11.4N 112.9E	PCN 4			PGTW
23	070717	11.9N 113.1E	PCN 3	T3.0/3.0 /D1.5/24HRS		RPMK
24	070900	11.7N 112.7E	PCN 4			PGTW
25	071100	11.7N 111.7E	PCN 4			RODN
26	071200	11.9N 112.0E	PCN 6			PGTW
27	071600	11.8N 111.4E	PCN 6	T3.0/3.0-/D1.0/24HRS		PGTW
28	071800	12.0N 111.2E	PCN 6			PGTW
29	072002	11.7N 111.5E	PCN 5			RPMK
30	072100	12.3N 111.4E	PCN 6			PGTW
31	072158	12.2N 111.4E	PCN 5			PGTW
32	072159	12.0N 110.6E	PCN 5			RODN
33	072341	11.6N 111.4E	PCN 5	T3.5/3.5-/D1.5/24HRS		RPMK
34	080000	12.3N 111.1E	PCN 6			PGTW
35	080400	13.0N 110.7E	PCN 4	T3.5/3.5-/D1.0/24HRS		PGTW
36	080600	13.2N 110.4E	PCN 4			PGTW
37	080705	12.6N 110.1E	PCN 5	T2.5/2.5	INIT OBS	RODN
38	080900	12.9N 110.0E	PCN 6			PGTW
39	081030	12.9N 109.5E	PCN 3			RPMK
40	081200	12.6N 109.5E	PCN 6			PGTW

41	001600	12.7N 108.8E	PCN 6	T2.5/3.5-/W0.5/24HRS	ULCC FIX	PGTW
42	001800	12.8N 108.5E	PCN 6		ULCC FIX	PGTW
43	001950	13.2N 108.7E	PCN 6			RODN
44	002100	12.9N 108.4E	PCN 6			PGTW
45	090000	13.2N 107.9E	PCN 6		ULCC FIX	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	070019	11.3N 113.8E	1500FT		998	50 140 20	220 44 140 20	20 4			+23 +24 +22 28	1

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON IDA
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
100612Z	17.0	146.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100618Z	17.4	145.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100700Z	17.9	143.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100706Z	18.0	142.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100712Z	18.4	141.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100718Z	19.0	139.9	30	18.8	140.9	30.	58.	0.	20.7	137.1	45.	238.	-10.	22.5	134.2	50.	304.	-10.	24.9	131.9	70.	501.	15.
100800Z	20.0	137.9	40	20.0	138.0	40.	6.	0.	23.0	134.4	45.	132.	-10.	25.5	133.2	50.	198.	-15.	27.4	132.8	70.	499.	15.
100806Z	20.8	136.4	40	20.8	136.5	40.	6.	0.	23.7	132.3	45.	71.	-15.	26.6	131.0	45.	261.	-20.	31.4	132.9	45.	548.	0.
100812Z	21.4	134.8	50	21.3	134.7	50.	8.	0.	23.6	130.2	70.	185.	10.	26.7	129.2	70.	407.	10.	0.0	0.0	0.	-0.	0.
100818Z	22.3	133.2	55	22.2	133.1	55.	8.	0.	25.5	129.4	70.	215.	10.	28.8	129.6	70.	405.	15.	0.0	0.0	0.	-0.	0.
100900Z	23.6	132.1	55	23.6	132.1	55.	0.	0.	27.9	131.5	65.	105.	0.	33.0	135.2	50.	200.	-5.	0.0	0.0	0.	-0.	0.
100906Z	24.8	131.8	60	24.8	131.7	60.	5.	0.	29.4	132.1	60.	95.	-5.	33.9	136.8	45.	310.	0.	0.0	0.0	0.	-0.	0.
100912Z	26.1	132.2	60	26.1	132.3	60.	5.	0.	34.0	130.7	45.	251.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100918Z	27.4	132.8	60	27.5	132.8	55.	6.	-5.	34.0	130.6	40.	154.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101000Z	28.8	133.2	65	28.7	133.2	65.	6.	0.	34.7	139.6	50.	65.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101006Z	30.3	133.6	65	30.5	133.5	65.	13.	0.	36.3	143.0	50.	72.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101012Z	31.4	134.8	60	31.4	134.8	60.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101018Z	32.3	136.3	55	32.3	136.3	55.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101100Z	33.7	139.1	55	33.6	139.8	55.	16.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101106Z	35.1	142.9	45	35.1	142.8	45.	5.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	10.	144.	298.	516.	6.	144.	298.	516.
AVG RIGHT ANGLE ERROR	6.	58.	95.	25.	6.	58.	95.	25.
AVG INTENSITY MAGNITUDE ERROR	0.	9.	11.	10.	0.	9.	11.	10.
AVG INTENSITY BIAS	-0.	-5.	-4.	10.	-0.	-5.	-4.	10.
NUMBER OF FORECASTS	15	11	7	3	14	11	7	3

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1889. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 17. KNOTS

TYPHOON IDA
FIX POSITIONS FOR CYCLONE NO. 14

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	050000	17.0N 156.0E	PCN 6			PGTW
2	061600	17.3N 145.4E	PCN 6			PGTW
3	062100	17.8N 144.8E	PCN 6			PGTW
4	070000	17.9N 143.9E	PCN 6	T1.5/1.5	INIT OBS	PGTW
5	070400	17.8N 143.3E	PCN 6		ULCC FIX	PGTW
6	070600	18.0N 142.9E	PCN 6		ULCC FIX	PGTW
7	070900	18.1N 142.5E	PCN 6		ULCC FIX	PGTW
8	071200	18.2N 142.0E	PCN 6			PGTW
* 9	071600	18.5N 141.5E	PCN 6	T2.0/2.0	INIT OBS	PGTW
* 10	071800	18.8N 140.9E	PCN 6		ULCC FIX	PGTW
11	072017	18.7N 140.2E	PCN 5			PGTW
12	080000	20.0N 138.0E	PCN 4			PGTW
13	080400	20.6N 137.1E	PCN 4	T3.0/3.0 /D1.5/24HRS		PGTW
14	080523	21.2N 136.5E	PCN 5	T3.5/3.5	INIT OBS	RODN
15	080600	20.9N 136.6E	PCN 4			PGTW
16	080857	21.1N 135.3E	PCN 4			PGTW
17	081040	21.3N 136.0E	PCN 3			RODN
18	081200	21.3N 134.7E	PCN 6			PGTW
19	081600	21.9N 133.6E	PCN 6	T3.5/3.5 /D0.5/24HRS	ULCC FIX	PGTW
20	081800	22.2N 133.1E	PCN 6		ULCC FIX	PGTW
21	082100	22.8N 132.4E	PCN 6			PGTW
22	082137	22.9N 132.5E	PCN 5			PGTW
23	082137	23.4N 133.0E	PCN 5	T3.0/3.0	INIT OBS	RPMK
24	082319	23.8N 132.4E	PCN 3			RODN
25	090000	23.7N 131.7E	PCN 4			PGTW
26	090400	24.5N 131.8E	PCN 2	T4.0/4.0 /D1.0/24HRS		PGTW
27	090518	24.8N 131.9E	PCN 1	T4.0/4.0 /D0.5/24HRS		RODN
28	090600	25.0N 131.9E	PCN 2			PGTW

29	090633	24.0N 131.9E	PCN 3	T4.0/4.0 /D1.0/09HRS		RPMK
30	090653	25.0N 132.2E	PCN 2			PGTW
31	090900	25.5N 131.9E	PCN 4			PGTW
32	091017	25.7N 132.3E	PCN 3			PGTW
33	091200	26.1N 132.3E	PCN 2			PGTW
34	091600	27.2N 132.6E	PCN 4	T3.5/3.5-/S0.0/24HRS		PGTW
35	091800	27.5N 132.8E	PCN 6		ULCC FIX	PGTW
36	092116	28.1N 133.2E	PCN 4			PGTW
37	092258	28.8N 133.3E	PCN 5		ULCC FIX	PGTW
38	092258	28.6N 133.1E	PCN 5			RODN
39	100000	28.6N 133.8E	PCN 6			PGTW
40	100300	29.6N 133.9E	PCN 6			PGTW
41	100600	30.0N 133.9E	PCN 6	T3.5/4.0-/W0.5/26HRS		PGTW
42	100900	30.6N 134.6E	PCN 6			PGTW
43	100956	31.0N 134.8E	PCN 3			PGTW
44	101200	31.4N 135.0E	PCN 4		ULCC FIX	PGTW
45	101600	31.8N 135.3E	PCN 4	T3.0/3.5 /W0.5/24HRS		PGTW
46	101800	32.1N 135.8E	PCN 6		ULCC FIX	PGTW
47	101925	32.8N 137.1E	PCN 5			RODN
48	102055	33.3N 137.6E	PCN 3		ULCC FIX	PGTW
49	102100	33.0N 137.4E	PCN 4		ULCC FIX	PGTW
50	102236	33.2N 138.2E	PCN 3	T3.0/3.0		RKSO
51	110000	33.8N 139.1E	PCN 6			PGTW
52	110300	34.6N 140.8E	PCN 4			PGTW
53	110445	34.9N 141.7E	PCN 6			PGTW
54	110600	35.1N 142.8E	PCN 6		ULCC FIX	PGTW
55	110900	35.8N 145.7E	PCN 6			PGTW
56	111200	36.0N 147.0E	PCN 6		ULCC FIX	PGTW
57	111600	36.8N 151.5E	PCN 6	T1.5/2.5 /W1.5/24HRS		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	080010	20.0N 137.9E	1500FT		1000	45 010 30	080 44 010 30	10 5			+25 +24 +22 31	1
2	080629	20.0N 136.3E	700MB	3059		50 020 90	120 50 350 25	10 5				2
3	080826	21.1N 135.5E	700MB	3056	997	30 340 90	100 44 010 77	4 5			+10 +12 +12	2
4	082355	23.6N 132.1E	700MB	2980	986	65 280 30	340 51 280 30	7 4			+25 +22	3
5	090238	24.1N 131.8E	700MB	2937		70 140 20	240 69 140 20	5 5			+15 +16	3
6	090616	24.8N 131.7E	700MB	2969		40 170 70	150 61 040 60	10 1			+13 +15 + 8	4
7	090854	25.3N 131.9E	700MB	2951	986	50 270 10	350 43 300 25	12 1			+13 +15 +10	4
8	092037	28.1N 133.0E	700MB	2910			190 80 130 60	10 5				5
9	092347	28.7N 133.1E	700MB	2905	977	80 280 10	350 67 330 10	10 3	CIRCULAR	8	+20 +22 +11	5
10	100534	30.1N 133.5E	700MB	2870		80 090 40	180 104 090 40	10 6	CIRCULAR	30	+16 +22	6
11	100756	30.6N 133.9E	700MB	2873	973	50 250 60	310 66 230 20	7 4			+15 +20	6
12	102038	33.1N 137.3E	700MB	2887		55 070 85	300 66 210 65		ELLIPTICAL	12 05 080	+15 +17 +13	7
13	102302	33.3N 138.2E	700MB	2901	979	70 160 35	280 76 170 35	5 2	ELLIPTICAL	12 08 060	+12 +14 +11	7

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	100300	29.6N 133.6E	LAND				35/12 53616		30.6N 131.0E	47869
2	100600	30.2N 133.8E	LAND				35/12 50111		30.6N 131.0E	47869
3	100800	30.6N 134.0E	LAND				35/11 50216		30.6N 131.0E	47869
4	100800	30.7N 133.8E	LAND				5//// 4////		33.3N 134.2E	47899
5	100900	30.9N 134.0E	LAND				5//// 50314		33.3N 134.2E	47899
6	100900	30.8N 134.1E	LAND				33/41 50216		30.6N 131.0E	47869
7	101000	31.0N 134.2E	LAND				5//// 50416		33.3N 134.2E	47899
8	101000	30.9N 134.2E	LAND				65/41 50311		30.6N 131.0E	47869
9	101100	31.2N 134.6E	LAND				5//// 50522		33.3N 134.2E	47899
10	101200	31.3N 134.8E	LAND				5//// 50622		33.3N 134.2E	47899
11	101200	31.4N 134.6E	LAND				55//2 /////		35.3N 138.7E	47639
12	101300	31.4N 135.0E	LAND				5//// 50516		33.3N 134.2E	47899
13	101300	31.5N 135.0E	LAND				55//2 50722		35.3N 138.7E	47639
14	101400	31.6N 135.2E	LAND				5//// 50616		33.3N 134.2E	47899
15	101400	31.7N 135.2E	LAND				55//2 50316		35.3N 138.7E	47639
16	101500	31.7N 135.5E	LAND				5//// 50616		33.3N 134.2E	47899
17	101500	31.8N 135.4E	LAND				45//3 50614		35.3N 138.7E	47639
18	101600	31.8N 135.7E	LAND				5//// 50619		33.3N 134.2E	47899
19	101600	31.8N 135.7E	LAND				65//3 50816		35.3N 138.7E	47639
20	101700	32.2N 136.0E	LAND				54//3 50616		35.3N 138.7E	47639
21	101700	31.9N 136.0E	LAND				5//// 50619		33.3N 134.2E	47899
22	101800	32.3N 136.2E	LAND				54//4 50416		35.3N 138.7E	47639
23	101800	32.2N 136.4E	LAND				5//// 50524		33.3N 134.2E	47899
24	101800	32.1N 136.6E	LAND				6//// /////		34.6N 135.7E	47773
25	101900	32.4N 136.7E	LAND				52/13 50622		35.3N 138.7E	47639
26	101900	32.3N 136.8E	LAND				5//// 50624		33.3N 134.2E	47899
27	101900	32.9N 136.9E	LAND				6//// /////		34.6N 135.7E	47773
28	102000	33.3N 137.6E	LAND				6//// /////		34.6N 135.7E	47773
29	102000	32.6N 137.1E	LAND				5//// 50524		33.3N 134.2E	47899
30	102100	33.1N 137.7E	LAND				55/// /////		35.2N 137.0E	47636
* 31	102100	32.7N 138.2E	LAND				6//// /////		34.6N 135.7E	47773

32	102200	33.0N	138.2E	LAND	65/// /////	35.2N	137.0E	47636
33	102300	33.3N	138.7E	LAND	65//4 50735	35.3N	138.7E	47639
34	110000	33.4N	139.4E	LAND	55//3 50732	35.3N	138.7E	47639

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON JOE
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
100806Z	8.0	134.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.C	0.0	0.	-0.	0.
100812Z	9.5	132.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100818Z	10.4	131.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100900Z	11.1	130.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100906Z	11.6	129.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100912Z	12.0	128.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100918Z	12.5	127.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101000Z	13.2	126.3	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101006Z	14.0	125.1	30	14.0	125.5	30.	23.	0.	15.7	120.9	30.	86.	0.	17.3	117.1	45.	105.	-5.	18.2	113.0	55.	145.	-10.
101012Z	14.9	123.5	30	15.0	123.5	30.	6.	0.	17.1	118.3	40.	36.	5.	17.5	114.0	50.	51.	0.	18.2	110.0	55.	246.	-10.
101018Z	15.6	122.1	30	15.5	122.3	30.	13.	0.	17.1	118.5	40.	78.	0.	17.5	114.4	50.	87.	-5.	18.1	110.2	55.	264.	5.
101100Z	16.2	120.9	30	15.8	121.4	30.	38.	0.	17.2	117.6	35.	86.	-10.	17.7	113.4	45.	121.	-15.	17.8	109.2	55.	330.	30.
101106Z	16.4	119.6	30	16.4	119.7	30.	6.	0.	17.2	114.8	40.	37.	-10.	17.7	110.6	50.	232.	-15.	0.0	0.0	0.	-0.	0.
101112Z	16.5	118.4	35	16.5	118.7	35.	17.	0.	17.4	113.7	55.	66.	5.	18.6	109.6	65.	243.	0.	0.0	0.0	0.	-0.	0.
101118Z	16.7	117.2	40	16.7	117.4	40.	11.	0.	17.7	112.5	60.	112.	5.	18.9	108.4	65.	272.	15.	0.0	0.0	0.	-0.	0.
101200Z	17.1	116.1	45	17.0	116.0	45.	8.	0.	18.2	111.3	60.	163.	0.	19.2	107.2	50.	309.	25.	0.0	0.0	0.	-0.	0.
101206Z	17.6	115.3	50	17.3	115.4	50.	19.	0.	18.5	111.9	55.	149.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101212Z	18.2	114.5	50	18.4	114.5	55.	12.	5.	22.0	111.9	55.	49.	-10.	0.0	6.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101218Z	18.9	114.0	55	18.9	113.8	55.	11.	0.	21.8	111.7	55.	31.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101300Z	19.7	113.7	60	19.6	113.5	55.	13.	-5.	22.9	113.2	45.	133.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101306Z	20.6	113.3	65	20.7	113.5	55.	13.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101312Z	21.5	112.6	65	21.6	112.7	60.	8.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101318Z	22.3	111.6	50	22.6	111.9	50.	25.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101400Z	23.1	110.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	15.	86.	177.	246.	14.	81.	159.	218.
AVG RIGHT ANGLE ERROR	10.	61.	151.	200.	11.	62.	129.	173.
AVG INTENSITY MAGNITUDE ERROR	2.	7.	10.	14.	3.	6.	8.	8.
AVG INTENSITY BIAS	-1.	0.	0.	4.	-2.	-2.	-4.	-5.
NUMBER OF FORECASTS	15	12	8	4	10	10	7	3

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1654. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 12. KNOTS

TYPHOON JOE
FIX POSITIONS FOR CYCLONE NO. 15

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	080400	7.2N 131.2E	PCN 6	T1.0/1.0	INIT OBS	PGTW
2	081200	11.3N 130.9E	PCN 6		ULCC FIX	PGTW
* 3	090000	13.8N 129.4E	PCN 6	T2.0/2.0 /D1.0/20HRS		PGTW
* 4	090400	12.7N 130.4E	PCN 6			PGTW
* 5	090653	13.0N 130.1E	PCN 5			PGTW
6	090653	11.4N 129.8E	PCN 3	T1.5/1.5		RFMK
* 7	091200	14.9N 127.0E	PCN 6			PGTW
8	092100	13.1N 126.4E	PCN 6		ULCC FIX	PGTW
9	092258	12.8N 127.0E	PCN 5			PGTW
10	100000	13.0N 125.5E	PCN 6			PGTW
* 11	100640	13.4N 126.1E	PCN 3	T1.5/1.5 /S0.0/24HRS		RPMK
12	100646	13.5N 126.4E	PCN 5	T2.5/2.5 /D0.5/30HRS		PGTW
13	100956	15.0N 123.2E	PCN 6			PGTW
14	101137	15.5N 122.9E	PCN 5			RODN
15	101137	15.5N 123.0E	PCN 5			RPMK
16	101200	15.0N 123.4E	PCN 6			PGTW
17	101600	15.4N 122.4E	PCN 6			PGTW
18	101800	15.4N 122.2E	PCN 6	T2.0/2.0	INIT OBS	PGTW
19	101925	15.5N 121.7E	PCN 5			PGTW
20	102100	15.7N 121.5E	PCN 6			PGTW
21	102237	15.4N 121.6E	PCN 5	T2.5/2.5 /D1.0/16HRS		RPMK
22	110000	16.0N 120.9E	PCN 6			PGTW
23	110017	16.1N 120.8E	PCN 5	T2.0/2.0	INIT OBS	RODN
24	110627	16.4N 118.7E	PCN 6	T2.0/2.0	INIT OBS	PGTW
25	111115	16.7N 118.6E	PCN 5			RODN
26	111200	16.4N 118.2E	PCN 6			PGTW

27	111600	16.6N 117.4E	PCN 6			PGTW
28	111800	16.6N 117.0E	PCN 6	T3.0/3.0 /D1.0/24HRS		PGTW
29	112100	16.7N 116.4E	PCN 6			PGTW
30	112216	17.4N 116.6E	PCN 3	T3.0/3.0+/D0.5/24HRS		RPMK
31	120000	17.2N 116.5E	PCN 6			PGTW
32	120300	17.2N 115.8E	PCN 6	T3.5/3.5 /D1.5/21HRS		PGTW
33	120600	17.3N 115.4E	PCN 6			PGTW
34	120757	17.8N 115.6E	PCN 5	T3.0/3.0	INIT OBS	RODN
35	120900	17.6N 115.0E	PCN 6			PGTW
36	121054	17.9N 114.6E	PCN 6			PGTW
37	121055	18.3N 114.0E	PCN 6		ULCC FIX	RODN
38	121200	18.2N 114.3E	PCN 4			PGTW
39	121600	18.6N 114.2E	PCN 6			PGTW
40	121800	18.8N 114.2E	PCN 6	T3.5/3.5-/D0.5/24HRS	ULCC FIX	PGTW
41	122042	19.3N 113.7E	PCN 5			RPMK
42	122154	19.4N 113.4E	PCN 5			PGTW
43	122333	19.6N 113.5E	PCN 5	T3.5/3.5 /S0.0/21HRS	ULCC FIX	PGTW
44	130000	19.6N 113.5E	PCN 6		ULCC FIX	PGTW
45	130300	20.0N 113.6E	PCN 2		EYE DIA 20NM	PGTW
46	130600	20.7N 113.4E	PCN 4			PGTW
47	130745	20.7N 113.1E	PCN 3	T4.0/4.0	INIT OBS	RPMK
48	130900	21.1N 113.1E	PCN 2		EYE DIA 12NM	PGTW
49	131034	21.4N 112.8E	PCN 5		ULCC FIX	RODN
50	131034	21.4N 112.8E	PCN 5			PGTW
51	131200	21.7N 112.5E	PCN 6		ULCC FIX	PGTW
52	131600	22.0N 112.0E	PCN 6		ULCC FIX	PGTW
53	131800	22.3N 111.8E	PCN 6		ULCC FIX	PGTW
54	132029	22.8N 111.7E	PCN 5		ULCC FIX	RODN
55	132100	22.9N 111.5E	PCN 6		ULCC FIX	PGTW
56	132314	23.2N 111.3E	PCN 6		ULCC FIX	RODN
57	140000	23.3N 111.1E	PCN 4	T2.0/3.0-/W1.5/24HRS		PGTW
58	140300	23.7N 110.9E	PCN 6			PGTW
59	140900	24.6N 110.2E	PCN 6			PGTW
60	141200	25.1N 110.6E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
* 1	100204	13.1N 126.5E	1500FT		1003	30 030 95	120 39 050 225	10 5			+29 +30 +26 30	1
2	100835	14.4N 124.8E	1500FT		1000	30 140 60	340 33 280 120	10 40			+24 +25 +21 29	2
3	112102	17.0N 116.7E	700MB	2998			160 55 060 65	10 8				3
4	112325	16.7N 116.1E	700MB	3008	992	40 120 60	230 50 120 55	12 8			+11 +12 + 8	3
5	120905	18.0N 115.1E	1500FT	2977	988	65 120 90	130 43 040 120	15 8			+24 +24	4
6	121056	18.0N 114.5E	1500FT		988	35 020 40	220 51 080 60	15 10			+23 +24 +24	4

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	101030	14.9N 123.8E	LAND				1013/ 42702		16.3N 120.6E	98321
2	101200	14.9N 123.7E	LAND				1011/ 42505		16.3N 120.6E	98321
3	101300	15.0N 123.5E	LAND				1014/ 42907	EYE 60 PCT CIR OPEN E	16.3N 120.6E	98321
4	101330	15.0N 123.4E	LAND				10141 42805		16.3N 120.6E	98321
5	101400	15.0N 123.3E	LAND				1514/ 42806		16.3N 120.6E	98321
* 6	102300	15.6N 122.1E	LAND				40000 /////		16.3N 120.6E	98321
* 7	110030	15.8N 121.7E	LAND				1081/ 42916	EYE 80 PCT CIR OPEN N DIA 40KMS	16.3N 120.6E	98321
* 8	110140	16.2N 121.5E	LAND				12391 43513	EYE 60 PCT ELLIPTICAL		
* 9	110140	16.1N 120.9E	LAND				25/// 42809		16.3N 120.6E	98321
10	110810	16.4N 119.6E	LAND				1070/ 82909		16.3N 120.6E	98321
11	111100	16.4N 119.1E	LAND				4//// 72708		16.3N 120.6E	98321
12	121150	18.3N 114.6E	LAND				22424 73212		16.8N 112.3E	59981
13	122100	19.2N 113.9E	LAND				1010/ /////		22.3N 114.2E	45005
14	130100	19.8N 113.9E	LAND				209/3 /////		22.3N 114.2E	45005
15	130300	20.1N 113.8E	LAND				1081/ 63510		22.3N 114.2E	45005
16	130400	20.3N 113.7E	LAND				1081/ 73511		22.3N 114.2E	45004
17	130650	20.5N 113.5E	LAND				12613 53210			59491
18	130659	20.9N 113.2E	LAND				14612 53312		21.8N 111.9E	59663
19	130750	20.7N 113.3E	LAND				12763 53210			59491
20	130759	21.0N 113.2E	LAND				14612 53312		21.8N 111.9E	59663
21	130800	20.9N 113.1E	LAND				10813 63211		22.3N 114.2E	45005
22	130850	21.0N 113.2E	LAND				12713 53210			59491
23	130859	21.2N 113.1E	LAND				10422 53312			59491
24	130859	21.1N 113.0E	LAND				3///2 73508		20.0N 110.3E	59750
25	130900	21.1N 113.1E	LAND				10423 63211		22.3N 114.2E	45005
26	131000	21.2N 112.9E	LAND				1041/ 63212		22.3N 114.2E	45005
27	131100	21.2N 112.9E	LAND				2086/ 73208		22.3N 114.2E	45005
28	131200	21.3N 112.6E	LAND				1068/ 73108		22.3N 114.2E	45005
29	131300	21.4N 112.7E	LAND				2066/ 73107		22.3N 114.2E	45005
30	131400	21.6N 112.5E	LAND				2066/ 83110		22.3N 114.2E	45005
31	131750	22.2N 111.6E	LAND				21541 53209		20.0N 110.3E	59759

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	130900	21.1N 113.1E	060	050	WMO 59673 40KTS AND 994.9MB CORRELATES W/SAT RD
2	131200	21.6N 112.8E	060	020	WMO 59673 60KTS AND 986.4MB
3	132100	22.6N 111.4E	030	020	WMO 59463 10KTS AND 1002.[illegible]B

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM KIM
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		BEST TRACK WIND	WARNING POSIT		WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT		24 HOUR FORECAST WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT		48 HOUR FORECAST WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT		72 HOUR FORECAST WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
101418Z	10.1	120.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101500Z	9.3	118.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101506Z	9.3	116.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101512Z	9.5	115.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101518Z	9.5	114.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101600Z	9.0	112.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101606Z	9.1	111.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101612Z	9.8	110.9	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101618Z	10.5	109.9	40	10.3	110.3	40.	26.	0.	11.9	108.2	30.	292.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101700Z	11.0	108.0	35	11.2	108.6	35.	37.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101706Z	11.6	106.2	30	11.5	106.2	30.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101712Z	11.9	104.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101718Z	12.8	103.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101800Z	13.6	102.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101806Z	14.2	101.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	ALL FORECASTS 24-HR	ALL FORECASTS 48-HR	ALL FORECASTS 72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	TYPHOONS WHILE OVER 35 KTS 24-HR	TYPHOONS WHILE OVER 35 KTS 48-HR	TYPHOONS WHILE OVER 35 KTS 72-HR
AVG FORECAST POSIT ERROR	23.	292.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	11.	55.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	0.	10.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	0.	10.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	3	1	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1224. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 15. KNOTS

TROPICAL STORM KIM
FIX POSITIONS FOR CYCLONE NO. 16

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	112100	10.8N 139.3E	PCN 6			PGTW
* 2	120000	12.6N 138.5E	PCN 5	T1.0/1.0	INIT OBS	PGTW
* 3	120900	12.8N 137.4E	PCN 6			PGTW
* 4	130300	10.0N 132.0E	PCN 6	T1.0/1.0 /S0.0/27HRS		PGTW
* 5	130600	10.1N 131.0E	PCN 6			PGTW
6	141600	10.4N 121.4E	PCN 6			PGTW
7	141800	10.4N 120.6E	PCN 6			PGTW
8	142100	9.8N 119.3E	PCN 6			PGTW
9	150000	9.0N 118.3E	PCN 6			PGTW
10	150300	9.3N 117.9E	PCN 6	T1.0/1.0	INIT OBS	PGTW
11	150600	9.6N 117.2E	PCN 6			PGTW
12	150900	9.6N 116.7E	PCN 6			PGTW
13	151200	9.3N 116.1E	PCN 6			PGTW
14	151600	9.9N 114.7E	PCN 6	T1.5/1.5	INIT OBS	PGTW
15	151800	9.4N 1[illegible].3E	PCN 6			PGTW
16	152100	9.7N 114.0E	PCN 6			PGTW
17	160000	9.0N 113.2E	PCN 6			PGTW
18	160300	9.1N 112.6E	PCN 6	T2.0/2.0 /D1.0/24HRS		PGTW
19	160600	8.6N 112.3E	PCN 6		ULCC FIX	PGTW
20	160900	9.0N 111.7E	PCN 6		ULCC FIX	PGTW
21	161112	9.6N 111.8E	PCN 5			RODN
22	161200	9.6N 111.2E	PCN 6		ULCC FIX	PGTW
23	161600	9.8N 110.6E	PCN 6	T3.0/3.0 /D1.5/24HRS		PGTW
24	161800	10.3N 110.3E	PCN 6			PGTW
25	161953	10.3N 109.6E	PCN 5		ULCC FIX	RODN
26	162100	10.8N 109.6E	PCN 6		ULCC FIX	PGTW
27	162211	10.9N 108.5E	PCN 5			RPMK
28	162347	10.8N 108.3E	PCN 5		ULCC FIX	RODN
29	170000	11.5N 108.2E	PCN 6			PGTW
30	170300	11.6N 107.0E	PCN 4	T2.5/2.5-/D0.5/24HRS		PGTW
31	170600	11.3N 105.9E	PCN 6		ULCC FIX	PGTW
32	170037	12.1N 105.5E	PCN 5	T2.5/2.5-	INIT OBS	RPMK
33	171200	12.9N 104.8E	PCN 6		ULCC FIX	PGTW
34	171600	12.9N 104.0E	PCN 6		ULCC FIX	PGTW
35	171800	13.2N 103.2E	PCN 6		ULCC FIX	PGTW
36	172100	13.2N 102.8E	PCN 6			PGTW
37	180000	13.7N 101.8E	PCN 6			PGTW
38	180300	13.9N 101.3E	PCN 6		ULAC FIX	PGTW

39 100600 14.5N 100.8E PCN 5 ULCC FIX PGTW

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	100500	13.8N 101.2E	LAND				66/// 42910		13.8N 100.6E	48455
2	100600	14.0N 101.3E	LAND				66/// 4////		13.8N 100.6E	48455
3	100700	14.1N 101.0E	LAND				66/// 42905		13.8N 100.6E	48455
4	100800	14.3N 100.8E	LAND				6//// /////		13.8N 100.6E	48455

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL CYCLONE 16-83
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
101012Z	14.6	99.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101018Z	14.8	98.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101900Z	15.1	96.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101906Z	15.9	95.8	30	15.7	95.5	30.	21.	0.	17.2	91.2	35.	161.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101912Z	16.8	94.9	30	16.8	95.0	30.	6.	0.	20.3	92.0	40.	51.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101918Z	17.7	94.2	30	17.9	93.7	30.	31.	0.	22.1	91.1	35.	106.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102000Z	18.3	93.7	25	18.5	94.1	25.	26.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102006Z	19.1	93.2	25	19.4	94.1	25.	54.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102012Z	19.9	92.8	25	20.2	93.2	25.	29.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102018Z	20.9	92.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	28.	106.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	25.	96.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	0.	13.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	0.	13.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	6	3	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 610. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 11. KNOTS

TC16(W)
FIX POSITIONS FOR CYCLONE NO. 16

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	101200	14.7N	99.8E	PCN 6		ULCC FIX	PGTW
2	101800	14.7N	98.3E	PCN 6			PGTW
3	102100	14.5N	97.6E	PCN 6			PGTW
4	102310	15.7N	96.8E	PCN 6	T1.5/1.5	INIT OBS ULAC 15.6N 96.7E	KGWC
5	190000	14.5N	96.7E	PCN 6			PGTW
6	190300	15.4N	96.1E	PCN 6	T2.0/2.0	INIT OBS	PGTW
7	190600	16.0N	95.8E	PCN 6			PGTW
8	190812	16.2N	95.6E	PCN 6		ULAC 16.6N 95.6E	KGWC
9	190900	16.7N	95.6E	PCN 6		ULCC FIX	PGTW
10	191150	17.2N	94.2E	PCN 6		ULAC 16.6N 94.9E	KGWC
11	191200	17.1N	94.6E	PCN 6		ULCC FIX	PGTW
12	191600	17.9N	93.8E	PCN 6	T1.5/1.5	INIT OBS	PGTW
13	191800	17.9N	93.5E	PCN 6			PGTW
14	192057	18.4N	94.8E	PCN 6			KGWC
15	192057	17.9N	94.2E	PCN 5			RPMK
16	192100	18.3N	94.1E	PCN 6			PGTW
17	200000	18.4N	93.7E	PCN 6			PGTW
18	200030	18.5N	94.5E	PCN 6		ULAC 17.0N 93.6E	KGWC
19	200300	18.9N	94.1E	PCN 6			PGTW
20	200600	19.5N	93.8E	PCN 6	T1.0/1.5 /W1.0/27HRS		PGTW
21	200900	19.8N	93.7E	PCN 6			PGTW
22	201130	18.9N	92.5E	PCN 5			RPMK
23	201200	20.3N	93.1E	PCN 6			PGTW
24	201302	20.1N	91.9E	PCN 6		EXP LLCC	KGWC
25	201600	20.7N	92.3E	PCN 6			PGTW
26	202045	21.6N	94.4E	PCN 5			RPMK

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON LEX
BEST TRACK DATA

	BEST TRACK			WARNING				24 HOUR FORECAST						48 HOUR FORECAST						72 HOUR FORECAST					
							ERRORS						ERRORS						ERRORS						ERRORS
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND		
102200Z	16.1	116.8	30	16.4	117.0	30.	21.	0.	17.0	114.5	45.	54.	-5.	17.4	112.0	50.	97.	-5.	17.7	109.5	50.	120.	-20.		
102206Z	16.1	115.5	35	16.3	115.6	30.	13.	-5.	17.3	112.5	40.	92.	-15.	18.0	109.7	35.	215.	-25.	18.6	106.8	35.	225.	-30.		
102212Z	16.5	114.8	40	16.6	114.8	30.	6.	-10.	17.4	111.4	40.	166.	-15.	18.6	108.2	45.	290.	-15.	20.8	105.7	25.	310.	-40.		
102218Z	17.2	114.8	45	16.7	114.2	30.	46.	-15.	17.8	111.0	45.	167.	-10.	19.3	108.1	50.	270.	-15.	21.9	106.2	40.	294.	-20.		
102300Z	17.9	114.6	50	17.9	114.5	35.	6.	-15.	19.8	112.4	45.	157.	-10.	21.6	110.0	40.	283.	-30.	0.0	0.0	0.	-0.	0.		
102306Z	17.5	114.1	55	17.6	114.3	45.	13.	-10.	19.5	114.6	40.	143.	-20.	21.4	114.8	40.	346.	-25.	23.3	116.0	35.	632.	-10.		
102312Z	17.6	114.3	55	17.4	114.0	45.	21.	-10.	18.5	111.9	40.	99.	-20.	20.1	109.9	40.	156.	-25.	0.0	0.0	0.	-0.	0.		
102318Z	17.5	113.9	55	17.8	113.8	45.	19.	-10.	19.4	112.5	40.	132.	-25.	21.5	111.6	40.	274.	-20.	0.0	0.0	0.	-0.	0.		
102400Z	17.5	113.7	55	17.7	113.7	45.	12.	-10.	19.4	112.5	40.	149.	-30.	21.5	111.6	40.	317.	-15.	0.0	0.0	0.	-0.	0.		
102406Z	17.4	113.4	60	17.6	112.8	50.	36.	-10.	19.3	111.7	45.	138.	-20.	21.2	111.2	40.	340.	-5.	0.0	0.0	0.	-0.	0.		
102412Z	17.3	113.1	60	17.4	112.5	50.	35.	-10.	18.2	110.4	45.	51.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.		
102418Z	17.2	112.3	65	17.3	112.1	55.	13.	-10.	17.8	110.0	50.	63.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.		
102500Z	17.1	111.5	70	16.8	112.1	60.	39.	-10.	16.4	108.9	55.	104.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.		
102506Z	17.3	110.5	65	17.3	110.7	65.	11.	0.	17.8	108.2	70.	103.	25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.		
102512Z	17.5	109.9	65	17.6	109.8	65.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.		
102518Z	17.7	108.9	60	17.7	108.8	65.	6.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.		
102600Z	17.7	107.7	55	17.8	107.8	55.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.		
102606Z	17.8	106.4	45	17.7	106.3	45.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.		

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	18.	116.	259.	316.	18.	116.	259.	316.
AVG RIGHT ANGLE ERROR	11.	69.	156.	137.	11.	69.	156.	137.
AVG INTENSITY MAGNITUDE ERROR	7.	16.	18.	24.	8.	16.	18.	24.
AVG INTENSITY BIAS	-7.	-13.	-18.	-24.	-7.	-13.	-18.	-24.
NUMBER OF FORECASTS	18	14	10	5	17	14	10	5

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 710. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 7. KNOTS

TYPHOON LEX
FIX POSITIONS FOR CYCLONE NO. 17

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	150600	5.0N 157.4E	PCN 6	T0.0/0.0		PGTW
* 2	150900	4.4N 154.5E	PCN 6			PGTW
* 3	151200	4.3N 154.2E	PCN 6			PGTW
* 4	172009	10.2N 138.0E	PCN 5			PGTW
* 5	180000	11.4N 136.9E	PCN 6			PGTW
* 6	180300	12.1N 135.5E	PCN 6			PGTW
7	191009	14.6N 129.9E	PCN 6	T1.0/1.0	INIT OBS	PGTW
8	191200	15.2N 129.5E	PCN 6		ULCC FIX	PGTW
9	191600	15.4N 129.3E	PCN 6	T1.5/1.5	INIT OBS	PGTW
10	191800	15.6N 128.7E	PCN 6			PGTW
11	192100	14.9N 127.1E	PCN 6			PGTW
12	192242	14.7N 126.9E	PCN 5			PGTW
13	200000	14.6N 126.2E	PCN 6			PGTW
14	200300	14.8N 125.1E	PCN 6	T1.5/1.5-/D0.5/17HRS		PGTW
15	200610	15.0N 124.5E	PCN 5		ULCC FIX	PGTW
16	200610	14.4N 124.6E	PCN 5	T2.0/2.0	INIT OBS	RPMK
17	200900	14.9N 123.7E	PCN 6		ULCC FIX	PGTW
18	200940	14.8N 123.4E	PCN 5		ULCC FIX	PGTW
19	201200	14.9N 122.8E	PCN 6		ULCC FIX	PGTW
20	201600	15.3N 122.1E	PCN 6	T2.0/2.0-/D0.5/24HRS		PGTW
21	201800	15.1N 121.9E	PCN 6		ULCC FIX	PGTW
22	201903	15.1N 121.6E	PCN 6			PGTW
23	202100	15.1N 121.5E	PCN 6			PGTW
24	202220	15.4N 119.2E	PCN 5	T1.5/1.5+/W0.5/16HRS		RPMK
25	210000	15.2N 120.1E	PCN 4			PGTW
26	210300	14.8N 119.5E	PCN 6	T2.0/2.0+/D0.5/24HRS		PGTW
27	210600	14.9N 118.8E	PCN 6			PGTW
28	210740	16.4N 117.3E	PCN 5	T2.0/2.0 /S0.0/25HRS		RPMK
29	210900	15.4N 118.1E	PCN 6			PGTW
30	211100	15.9N 117.7E	PCN 5			PGTW
31	211100	15.8N 117.9E	PCN 6			RODN
32	211600	16.5N 117.4E	PCN 6	T2.0/2.0 /S0.0/24HRS	ULCC FIX	PGTW
33	211800	16.7N 117.2E	PCN 6		ULCC FIX	PGTW

34	212033	15.5N 117.2E	PCN 5			RPMK
35	212100	15.4N 117.3E	PCN 6		ULCC FIX	PGTW
36	212207	15.8N 117.2E	PCN 5			PGTW
* 37	220000	17.2N 116.9E	PCN 6			PGTW
* 38	220300	17.3N 116.2E	PCN 6	T2.5/2.5 /D0.5/24HRS		PGTW
39	220600	16.3N 115.6E	PCN 4			PGTW
40	220735	16.4N 115.1E	PCN 5	T2.0/2.0 /S0.0/24HRS		RPMK
41	220900	16.4N 115.2E	PCN 6			PGTW
42	221047	16.6N 115.2E	PCN 6		ULCC FIX	RODN
43	221200	16.5N 114.9E	PCN 6			PGTW
44	221219	16.6N 114.7E	PCN 3			RPMK
45	221600	16.4N 114.7E	PCN 6	T3.0/3.0 /D1.0/24HRS		PGTW
* 46	221800	16.2N 114.7E	PCN 6		ULCC FIX	PGTW
47	222020	18.2N 114.9E	PCN 6		ULCC FIX	RODN
48	222100	17.9N 114.7E	PCN 6		ULCC FIX	PGTW
49	222146	17.8N 114.5E	PCN 5		ULCC FIX	PGTW
* 50	222318	17.0N 115.1E	PCN 5	T2.5/2.5 /D0.5/16HRS		RPMK
51	230000	18.0N 114.6E	PCN 6			PGTW
52	230300	17.8N 114.1E	PCN 4	T3.5/3.5 /D1.0/24HRS		PGTW
53	230600	17.6N 114.3E	PCN 4			PGTW
54	230723	17.6N 114.5E	PCN 3	T3.0/3.0 /D1.0/24HRS		RPMK
55	230900	17.4N 114.0E	PCN 6			PGTW
56	231026	17.5N 114.2E	PCN 4			PGTW
57	231157	17.4N 114.4E	PCN 3			RPMK
58	231200	17.4N 114.0E	PCN 4			PGTW
59	231600	17.5N 113.9E	PCN 6	T3.5/3.5 /D0.5/24HRS	ULCC FIX	PGTW
60	231800	17.8N 113.8E	PCN 6			PGTW
61	232000	17.7N 113.8E	PCN 5			RPMK
62	232100	18.0N 113.5E	PCN 6			PGTW
63	232306	17.9N 113.8E	PCN 4	T3.0/3.0	INIT OBS	RODN
64	232306	17.7N 114.1E	PCN 5	T3.0/3.0 /D0.5/24HRS		RPMK
65	240000	17.2N 113.4E	PCN 6			PGTW
66	240037	18.0N 113.5E	PCN 3			RODN
67	240037	17.2N 113.4E	PCN 5	T3.5/3.5 /D0.5/25HRS		RPMK
68	240300	17.5N 113.2E	PCN 6	T4.0/4.0-/D0.5/24HRS		PGTW
69	240600	17.5N 112.8E	PCN 6			PGTW
70	241136	16.9N 113.3E	PCN 3			RODN
71	241136	17.1N 112.9E	PCN 3			RPMK
72	241200	17.2N 112.5E	PCN 6			PGTW
73	241600	17.5N 112.4E	PCN 6	T4.0/4.0 /S0.0/13HRS		PGTW
74	241800	17.3N 112.1E	PCN 6			PGTW
75	241955	16.8N 112.3E	PCN 5			RKSO
76	242100	17.2N 111.8E	PCN 6			PGTW
* 77	242245	16.8N 112.4E	PCN 4	T3.5/3.5 /D0.5/24HRS		RODN
78	250000	16.8N 112.0E	PCN 6			PGTW
79	250300	17.3N 111.1E	PCN 4	T4.5/4.5-/D0.5/24HRS		PGTW
80	250658	17.4N 110.4E	PCN 3			PGTW
81	251125	17.6N 109.9E	PCN 3		ULCC FIX	RODN
82	251125	17.8N 110.1E	PCN 4			RPMK
83	251200	17.5N 109.9E	PCN 6			PGTW
84	251600	17.5N 109.3E	PCN 4	T4.5/4.0-/S0.0/24HRS		PGTW
85	251800	17.7N 108.8E	PCN 2			PGTW
86	251943	17.7N 108.7E	PCN 3			RPMK
87	252100	17.9N 108.2E	PCN 4			PGTW
88	252224	17.5N 107.9E	PCN 3	T3.5/3.5 /S0.0/24HRS		RODN
89	252224	17.5N 107.8E	PCN 3			RPMK
90	260000	17.7N 107.7E	PCN 4			PGTW
91	260300	17.7N 107.0E	PCN 4	T4.0/4.0-/W0.5/24HRS		PGTW
92	260600	17.7N 106.3E	PCN 4			PGTW
93	260900	17.8N 105.8E	PCN 6			PGTW
94	261104	18.1N 105.6E	PCN 5			RODN
95	261233	18.2N 105.5E	PCN 6			RODN
96	261600	18.2N 104.4E	PCN 6	T1.0/2.0 /W3.0/24HRS		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	220535	16.1N 115.2E	1500FT		1003	35 070 70	150 39 080 80	5 50			+26 +26 32	2

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	201400	15.7N 124.0E	LAND				1031/ 52910	EYE 50 PCT CIR	16.3N 120.6E	98321
2	201500	15.8N 123.9E	LAND				103// 52909	EYE 50 PCT NORTH	16.3N 120.6E	98321
3	210630	16.3N 120.3E	LAND				15/// 52912		16.3N 120.6E	98321
4	210700	16.5N 120.1E	LAND				1040/ 52914		16.3N 120.6E	98321
5	210730	16.7N 119.9E	LAND				1041/ 32914		16.3N 120.6E	98321
6	210800	16.6N 119.8E	LAND				1041/ 42914		16.3N 120.6E	98321
7	210830	16.8N 119.8E	LAND				1041/ 42914		16.3N 120.6E	98321
8	210900	16.9N 119.5E	LAND				1144/ 43007		16.3N 120.6E	98321
9	211100	16.8N 118.9E	LAND				15/// 52615		16.3N 120.6E	98321
10	211200	16.6N 118.6E	LAND				4//// 52512		16.3N 120.6E	98321
11	211330	16.5N 116.3E	LAND				15/// 52514		16.3N 120.6E	98321
12	242350	17.1N 111.4E	LAND				20744 52906		16.8N 112.3E	59981

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

SUPER TYPHOON MARGE
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		BEST TRACK WIND	WARNING POSIT		WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT		24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT		48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT		72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
103012Z	6.3	149.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
103018Z	7.3	148.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
103100Z	8.2	147.4	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
103106Z	9.7	146.2	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
103112Z	10.4	145.4	35	11.2	144.5	30.	72.	-5.	15.8	143.7	45.	224.	5.	19.8	147.0	65.	444.	-5.	22.0	151.8	75.	849.	-30.
103118Z	10.7	144.5	35	10.9	144.6	35.	13.	0.	12.8	143.5	45.	148.	0.	16.8	144.0	65.	247.	-10.	20.2	147.7	75.	650.	-55.
110100Z	11.2	143.2	35	10.3	142.2	50.	80.	15.	12.3	137.6	65.	219.	15.	15.8	135.4	75.	225.	-5.	20.4	137.6	65.	185.	-75.
110106Z	11.8	142.1	35	11.7	141.9	35.	13.	0.	14.3	137.0	50.	195.	-15.	19.0	136.3	60.	153.	-30.	23.3	141.2	45.	476.	-100.
110112Z	12.8	141.4	40	12.8	141.2	35.	12.	-5.	16.2	137.8	50.	138.	-20.	20.3	137.5	60.	162.	-45.	23.7	141.8	45.	520.	-95.
110118Z	13.6	141.1	45	14.4	141.3	50.	49.	5.	19.2	141.5	60.	187.	-15.	22.7	145.5	50.	582.	-80.	25.0	150.5	45.	990.	-90.
110200Z	14.5	140.6	50	14.8	140.3	50.	25.	0.	19.5	139.3	65.	150.	-15.	23.3	144.3	55.	590.	-85.	26.3	152.5	40.	1112.	-90.
110206Z	15.3	140.2	65	15.5	140.5	65.	21.	0.	19.7	139.5	75.	159.	-15.	23.4	144.4	55.	629.	-90.	26.3	152.5	40.	1101.	-90.
110212Z	16.2	140.2	70	16.5	140.0	65.	21.	-5.	20.8	142.1	65.	324.	-40.	24.0	147.0	55.	782.	-85.	27.0	157.6	40.	1342.	-85.
110218Z	16.6	139.7	75	17.0	139.7	70.	24.	-5.	21.0	140.0	70.	272.	-60.	25.5	145.0	60.	727.	-75.	28.4	154.0	40.	1129.	-80.
110300Z	17.0	139.1	80	17.0	138.9	75.	11.	-5.	20.4	137.5	85.	181.	-55.	25.1	140.6	75.	502.	-55.	28.3	146.5	50.	688.	-70.
110306Z	17.3	138.3	90	17.4	138.1	90.	13.	0.	19.2	135.1	120.	61.	-25.	22.6	133.1	110.	141.	-20.	26.0	137.0	100.	130.	-15.
110312Z	17.6	137.5	105	17.6	137.3	100.	11.	-5.	18.3	133.9	120.	29.	-20.	20.6	130.5	115.	194.	-10.	25.0	131.5	105.	457.	-10.
110318Z	17.9	136.5	130	18.0	136.3	110.	13.	-20.	19.7	132.5	120.	79.	-15.	22.8	130.5	110.	230.	-10.	27.0	133.0	95.	567.	-5.
110400Z	18.2	135.3	140	18.2	135.1	140.	11.	0.	19.6	131.0	160.	147.	30.	22.6	128.0	150.	410.	30.	26.7	127.1	140.	1133.	50.
110406Z	18.3	134.6	145	18.5	134.3	145.	21.	0.	20.1	130.2	145.	192.	15.	23.7	127.5	125.	554.	10.	0.0	0.0	0.	-0.	0.
110412Z	18.7	134.2	140	18.7	134.1	145.	6.	5.	19.5	131.4	140.	174.	15.	22.4	128.3	125.	661.	10.	0.0	0.0	0.	-0.	0.
110418Z	19.2	133.8	135	19.2	133.4	145.	23.	10.	21.2	130.4	130.	232.	10.	24.0	127.5	110.	899.	10.	0.0	0.0	0.	-0.	0.
110500Z	19.8	133.6	130	19.8	133.3	130.	17.	0.	21.8	131.8	120.	207.	0.	25.0	129.4	110.	1056.	20.	0.0	0.0	0.	-0.	0.
110506Z	20.3	133.6	130	20.3	133.3	130.	17.	0.	22.4	133.0	120.	269.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110512Z	21.2	133.9	125	21.3	133.7	125.	13.	0.	25.3	138.0	105.	103.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110518Z	21.8	134.5	120	21.8	134.4	115.	6.	-5.	25.9	139.2	95.	264.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110600Z	22.7	135.4	120	22.7	135.6	115.	11.	-5.	27.2	141.2	95.	434.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110606Z	23.9	137.6	115	23.9	137.5	105.	5.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110612Z	25.4	139.9	115	25.4	140.1	100.	11.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110618Z	27.9	143.6	100	27.8	143.6	90.	6.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110700Z	31.2	148.1	90	31.2	148.1	120.	0.	30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	ALL FORECASTS 24-HR	ALL FORECASTS 48-HR	ALL FORECASTS 72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	TYPHOONS WHILE OVER 35 KTS 24-HR	TYPHOONS WHILE OVER 35 KTS 48-HR	TYPHOONS WHILE OVER 35 KTS 72-HR
AVG FORECAST POSIT ERROR	19.	191.	484.	755.	19.	191.	484.	755.
AVG RIGHT ANGLE ERROR	14.	134.	240.	282.	14.	134.	240.	282.
AVG INTENSITY MAGNITUDE ERROR	6.	18.	36.	63.	6.	18.	36.	63.
AVG INTENSITY BIAS	-1.	-9.	-28.	-56.	-1.	-9.	-28.	-56.
NUMBER OF FORECASTS	27	23	19	15	27	23	19	15

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2370. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 13. KNOTS

SUPER TYPHOON MARGE
FIX POSITIONS FOR CYCLONE NO. 18

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
	1	290300	4.8N 156.0E	PCN 6	T1.5/1.5	INIT OBS	PGTW
	2	290600	3.8N 155.7E	PCN 6			PGTW
	3	290900	3.8N 155.2E	PCN 6			PGTW
*	4	292100	2.2N 152.5E	PCN 6		ULCC FIX	PGTW
	5	300300	5.9N 151.1E	PCN 6	T1.5/1.5+/S0.0/24HRS		PGTW
	6	300600	5.9N 149.5E	PCN 6			PGTW
	7	300900	5.5N 149.3E	PCN 6			PGTW
	8	300924	5.5N 149.3E	PCN 5			PGTW
	9	301200	6.7N 149.4E	PCN 6			PGTW
	10	301600	7.0N 148.9E	PCN 6	T2.0/2.0+	INIT OBS ULCC FIX	PGTW
	11	301800	7.4N 148.3E	PCN 6		ULCC FIX	PGTW
	12	302039	7.7N 147.7E	PCN 5			PGTW
	13	302204	7.7N 146.9E	PCN 5			PGTW
	14	310000	7.5N 146.7E	PCN 6			PGTW
*	15	310300	7.0N 145.9E	PCN 6		ULCC FIX	PGTW
	16	310544	9.8N 145.8E	PCN 3	T2.5/2.5 /D1.0/20HRS		PGTW
	17	310600	10.5N 145.4E	PCN 4			PGTW
	18	310900	10.6N 144.8E	PCN 6			PGTW
	19	311200	10.7N 144.8E	PCN 6			PGTW
	20	311600	10.9N 144.7E	PCN 6			PGTW
	21	311829	10.9N 144.6E	PCN 6	T3.0/3.0 /D1.0/26HRS		PGTW

22	312017	10.9N 143.9E	PCN 5			PGTW
23	312143	11.1N 143.6E	PCN 5			PGTW
* 24	010000	10.1N 142.7E	PCN 6			PGTW
25	010300	10.5N 142.6E	PCN 6	T2.5/2.5 /S0.0/21HRS	ULCC FIX	PGTW
26	010531	11.4N 142.2E	PCN 5			PGTW
27	010531	11.4N 142.4E	PCN 5	T2.5/2.5		RODN
28	010900	12.1N 142.0E	PCN 6			PGTW
29	011022	12.6N 141.4E	PCN 4			PGTW
30	011200	12.8N 141.2E	PCN 6			PGTW
31	011600	13.4N 141.4E	PCN 6	T4.0/4.0 /D1.0/22HRS		PGTW
32	011816	14.4N 141.4E	PCN 5			PGTW
33	011956	14.6N 141.3E	PCN 6			PGTW
34	012302	14.6N 140.5E	PCN 3			PGTW
35	012302	14.5N 140.8E	PCN 3	T4.0/4.0	INIT OBS	RPMK
36	020000	14.6N 140.4E	PCN 2			PGTW
37	020300	15.1N 140.1E	PCN 2	T4.0/4.0 /D1.5/24HRS	EYE DIA 20NM	PGTW
38	020519	14.7N 139.8E	PCN 3	T4.0/4.0 /D1.5/24HRS		RODN
39	020519	15.3N 139.8E	PCN 3			PGTW
40	020836	15.9N 140.0E	PCN 4			PGTW
41	021001	16.2N 140.4E	PCN 3			PGTW
42	021200	16.7N 140.3E	PCN 6		ULCC FIX	PGTW
43	021600	16.8N 139.6E	PCN 6	T5.0/5.0-/D1.0/24HRS		PGTW
44	021803	16.9N 139.5E	PCN 6			PGTW
45	022100	17.0N 139.2E	PCN 4			PGTW
46	022240	17.1N 138.9E	PCN 1	T5.0/5.0-/D1.0/24HRS	EYE DIA 30NM	RPMK
47	030000	17.1N 138.9E	PCN 2			PGTW
48	030300	17.3N 138.6E	PCN 2	T4.5/4.5 /D0.5/24HRS		PGTW
49	030506	17.2N 138.2E	PCN 1	T5.0/5.0 /D1.0/24HRS		RODN
50	030600	17.5N 138.4E	PCN 2		EYE DIA 18NM	PGTW
51	030900	17.7N 137.8E	PCN 2		EYE DIA 18NM	PGTW
52	031200	17.7N 137.3E	PCN 2			PGTW
53	031600	17.9N 136.6E	PCN 2	T6.0/6.0-/D1.0/24HRS		PGTW
54	031800	18.0N 136.3E	PCN 2			PGTW
55	032100	18.1N 135.8E	PCN 2			PGTW
56	032218	18.6N 135.5E	PCN 2			PGTW
57	040000	18.2N 135.3E	PCN 2			PGTW
58	040300	18.3N 134.8E	PCN 2	T7.0/7.0-/D2.5/24HRS		PGTW
59	040600	18.5N 134.5E	PCN 2		EYE DIA 36NM	PGTW
60	040900	18.5N 134.3E	PCN 2		EYE DIA 36NM	PGTW
61	041058	18.8N 134.5E	PCN 1			RPMK
62	041200	18.7N 134.1E	PCN 2		EYE DIA 36NM	PGTW
63	041600	19.2N 133.7E	PCN 2	T6.0/6.0-/S0.0/24HRS		PGTW
64	041800	19.3N 133.5E	PCN 2			PGTW
65	042100	19.6N 133.5E	PCN 2			PGTW
66	042338	19.8N 133.5E	PCN 1			RODN
67	050000	19.7N 133.3E	PCN 2			PGTW
68	050300	20.2N 133.2E	PCN 2	T5.5/6.5 /W1.5/24HRS		PGTW
69	050600	20.3N 133.5E	PCN 2			PGTW
70	050623	20.2N 133.6E	PCN 1	T5.0/5.0	INIT OBS	RODN
71	050623	20.4N 133.3E	PCN 1	T5.0/5.0	INIT OBS	RPMK
72	050914	20.7N 133.6E	PCN 2			PGTW
73	051200	21.0N 133.8E	PCN 2			PGTW
74	051600	21.5N 134.2E	PCN 2	T5.0/6.0 /W1.0/24HRS		PGTW
75	051800	21.6N 134.5E	PCN 2			PGTW
76	051909	21.9N 134.6E	PCN 1			PGTW
77	052013	22.0N 134.9E	PCN 1			PGTW
78	052316	22.5N 135.5E	PCN 1			PGTW
79	052316	22.3N 135.7E	PCN 1	T4.0/5.0 /W1.0/17HRS		RPMK
80	060300	23.2N 136.3E	PCN 2	T5.0/6.0 /W0.5/24HRS		PGTW
81	060611	23.9N 137.5E	PCN 1			PGTW
82	060853	24.5N 138.4E	PCN 1			PGTW
83	061014	25.0N 139.2E	PCN 1			PGTW
84	061200	25.4N 139.9E	PCN 2			PGTW
85	061600	27.0N 142.0E	PCN 2	T4.5/5.5-/W0.5/24HRS		PGTW
86	061800	27.8N 143.6E	PCN 4			PGTW
87	061856	28.2N 144.4E	PCN 3			PGTW
88	061952	29.0N 145.2E	PCN 6			PGTW
89	062100	29.2N 145.7E	PCN 4			PGTW
90	062254	30.3N 147.6E	PCN 3	T4.0/4.0	INIT OBS	RODN
91	062254	30.1N 147.7E	PCN 3			PGTW
92	070000	31.1N 148.2E	PCN 6			PGTW
93	070300	33.3N 150.9E	PCN 6	T3.5/4.5-/W1.5/24HRS		PGTW
94	070600	34.8N 152.8E	PCN 6		EXP LLCC	PGTW
95	071200	37.6N 157.3E	PCN 6		EXP LLCC	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIEN-TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
* 1	010105	10.0N 141.6E	1500FT		1005	50 050 170	110 53 050 170	5 10			+27 +26 +25 30	2
2	010640	12.2N 141.8E	700MB	3060		30 020 140	150 45 020 140	5 5				3
3	010949	12.7N 141.3E	700MB	3064	999		010 35 270 30	5 5			+11 +10	3
4	012100	14.1N 140.6E	1500FT	3018	991	45 010 30	110 43 010 30	8 5			+25 +26 +24 30	4
5	012344	14.5N 140.3E	1500FT		991	55 260 35	300 49 260 35	8 1			+25 +27 +23 31	[illegible]
6	020547	15.3N 140.1E	700MB	2979		60 110 48	200 60 110 48	8 6	ELLIPTICAL	40 20 090	+10 +17 + 8	[illegible]
7	020813	15.7N 140.0E	700MB	2966	985	50 310 20	020 56 310 20	10 6	ELLIPTICAL	40 20 060	+14 +16 + 7	[illegible]
8	022040	16.8N 139.2E	700MB	2819		65 330 35	140 79 050 20	5 1	ELLIPTICAL	30 20 060	+11 +18 +10	[illegible]

	9	022331	17.0N	138.9E	700MB	2793	964	60	310	10	230	97	140	12	5	1	ELLIPTICAL	35	25	360	+10	+18	+ 8	[illegible]
	10	030552	17.3N	138.2E	700MB	2665	949	90	090	60	180	98	080	30	10	2					+15	+19	+17	7
	11	030833	17.6N	137.8E	700MB	2575	940	50	340	8	190	92	080	25	10	3	CIRCULAR	15			+12	+19	+ 9	8
	12	031105	17.6N	137.5E	700MB	2507					360	91	290	30	10	3								8
	13	032031	18.1N	135.8E	700MB	2266		130	360	9	100	113	350	29	10	10	CIRCULAR	21			+12	+21	+14	9
	14	032347	18.2N	135.2E	700MB	2187	897	130	190	10	220	136	190	5	8	1	ELLIPTICAL	27	20	010	+19	+25	+12	9
	15	040631	18.5N	134.2E	700MB	2154		100	040	40	140	109	040	30	10	1	CIRCULAR	15			+13	+21	+15	[illegible]
	16	040919	18.7N	134.2E	700MB	2157	896	70	310	55	350	131	260	18	5	2	CIRCULAR	20			+16	+20	+15	[illegible]
	17	042041	19.6N	133.6E	700MB	2279		100	020	14	130	108	020	12	8	2								11
	18	042327	19.8N	133.4E	700MB	2295	909	130	310	10	050	120	310	10	8	2	CIRCULAR	20			+13	+19	+17	11
	19	050830	20.5N	133.4E	700MB	2276		40	140	95	200	119	100	20	7	3						+19	+ 8	[illegible]
	20	051105	21.2N	133.6E	700MB	2311	913				100	124	210	10	8	3	CIRCULAR	24			+13	+18	+ 7	12
	21	052031	22.1N	134.9E	700MB	2396		80	320	80	150	111	070	13	15	2	CIRCULAR	25			+15	+17		[illegible]
	22	052325	22.6N	135.4E	700MB	2423	923	100	200	26	170	147	070	35	8	4	CIRCULAR	40			+15	+19		[illegible]
*	23	060830	25.3N	137.7E	700MB	2315		110	220	17	230	119	140	90	6	4						+ 9	+ 4	14
	24	061115	25.2N	139.8E	700MB	2439	927				030	48	290	80	5	5	CIRCULAR	32			+11	+17	+ 7	14
	25	062036	29.2N	145.4E	700MB	2593		130	200	40	280	116	200	40	5	10								15
	26	062356	31.2N	147.8E	700MB	2665	954	120	180	20					5	5					+10	+18	+12	[illegible]
	27	070532	34.8N	152.3E	700MB	2769	959	90	220	91	270	85	220	91	10	5					+18	+26		[illegible]
	28	070905	37.8N	152.1E	700MB	2891					250	72	150	115	10	20					+ 8	+ 4		[illegible]

NOTICE - THE ASTERISKS (*) INDICATE FIXE UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM NORRIS
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
110800Z	16.8	156.5	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110806Z	17.4	154.7	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110812Z	17.9	153.8	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110818Z	18.4	152.1	45	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110900Z	18.8	151.8	50	18.6	151.6	50.	17.	0.	21.0	151.2	50.	110.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110906Z	19.4	151.5	45	19.5	151.4	50.	8.	5.	23.6	153.7	35.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110912Z	20.2	151.5	45	20.0	151.8	40.	21.	-5.	23.1	156.0	30.	132.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110918Z	21.1	151.8	45	21.2	152.2	35.	23.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111000Z	22.2	152.7	45	22.1	152.8	45.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111006Z	23.4	153.7	35	23.1	153.9	40.	21.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111012Z	24.9	154.6	25	24.6	154.1	40.	33.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	19.	85.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	15.	53.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	6.	3.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	1.	3.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	7	3	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 721. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 12. KNOTS

TROPICAL STORM NORRIS
FIX POSITIONS FOR CYCLONE NO. 19

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	072051	16.5N	157.5E	PCN 4	T1.5/1.5	INIT OBS	PGTW
2	080000	16.6N	156.5E	PCN 6			PGTW
3	080300	17.1N	155.8E	PCN 6			PGTW
4	080600	17.4N	154.9E	PCN 6			PGTW
5	080900	17.5N	154.3E	PCN 6			PGTW
6	080931	17.5N	153.9E	PCN 5			PGTW
7	081200	17.6N	153.4E	PCN 6			PGTW
8	081649	18.3N	152.1E	PCN 5	T2.0/2.0	INIT OBS	PGTW
9	081910	18.4N	151.8E	PCN 6			PGTW
10	082210	18.5N	151.9E	PCN 3	T3.0/3.0 /D1.5/25HRS		PGTW
11	090000	18.5N	152.0E	PCN 4			PGTW
12	090300	18.6N	151.6E	PCN 4			PGTW
13	090534	18.8N	152.1E	PCN 4			PGTW
14	090750	19.3N	151.9E	PCN 6			PGTW
15	090909	19.3N	152.0E	PCN 6			PGTW
16	091200	19.7N	152.3E	PCN 6			PGTW
17	091600	20.9N	151.6E	PCN 6			PGTW
18	091819	21.2N	152.0E	PCN 5	T2.0/2.0-/S0.0/25HRS		PGTW
19	092030	21.7N	152.7E	PCN 5			PGTW
20	092149	21.7N	153.2E	PCN 5			PGTW
21	100000	22.0N	153.1E	PCN 6			PGTW
22	100522	23.0N	153.8E	PCN 3	T3.0/3.00	INIT OBS EXP LLCC	PGTW
23	100522	23.2N	154.0E	PCN 6	T2.5/2.5	INIT OBS	RPMK
24	100600	23.3N	153.7E	PCN 4			PGTW
25	100847	23.7N	153.9E	PCN 6			PGTW
26	101200	24.5N	154.6E	PCN 6			PGTW
27	101807	25.9N	155.8E	PCN 6			PGTW
28	102157	26.6N	156.5E	PCN 3			PGTW
29	110000	27.5N	157.5E	PCN 6	T2.0/2.0-/W1.5/18HRS	ULCC FIX	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/	IN/	DP/	SST	MSN NO.
1	082249	18.7N 151.8E	700MB	3038		50 220 15		6 3	CIRCULAR	15		+16			1
2	090636	19.7N 151.5E	1500FT		994	50 130 20	230 55 130 20	7 2			+23	+26	+24	32	2
3	090824	20.1N 151.4E	700MB	3056			150 45 040 25	8 4	ELLIPTICAL	20 15 140	+11	+17	+ 9		2
4	092057	21.5N 152.4E	700MB	3070		45 360 08	260 48 230 15	6 1			+14	+20	+ 3		3
5	092352	22.1N 152.8E	700MB	3090	998	45 030 25	130 25 040 70	5 1			+11	+17	+ 3		3
6	100859	24.0N 153.8E	850MB				270 45 130 40	5 5				+20	+20		4

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON ORCHID
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
111412Z	13.0	147.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111418Z	13.3	146.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111500Z	12.7	145.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111506Z	12.3	144.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111512Z	12.0	143.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111518Z	11.8	142.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111600Z	11.3	141.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111606Z	10.3	141.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111612Z	9.3	139.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111618Z	9.7	138.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111700Z	9.7	136.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111706Z	10.4	134.6	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111712Z	12.0	132.9	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111718Z	12.4	131.6	35	12.4	131.1	35.	29.	0.	16.0	126.5	55.	240.	5.	19.2	123.3	70.	493.	5.	22.2	122.2	90.	589.	5.
111800Z	12.5	130.5	35	12.6	130.6	35.	8.	0.	15.3	126.9	50.	168.	0.	17.9	124.8	55.	376.	-15.	21.0	125.3	45.	452.	-45.
111806Z	13.0	129.7	40	13.5	129.1	35.	46.	-5.	17.2	124.9	50.	328.	-5.	20.3	124.7	50.	478.	-25.	23.4	128.7	40.	593.	-55.
111812Z	12.8	128.8	45	12.8	128.6	40.	12.	-5.	14.2	128.2	50.	122.	-10.	15.8	126.0	50.	177.	-30.	18.1	124.4	40.	242.	-60.
111818Z	12.5	128.5	50	12.2	128.4	45.	19.	-5.	13.9	128.7	50.	126.	-15.	15.5	126.3	50.	138.	-35.	17.7	124.6	45.	192.	-55.
111900Z	12.8	128.2	50	12.6	128.1	50.	13.	0.	13.4	126.1	40.	109.	-30.	14.1	124.1	30.	122.	-60.	14.5	122.1	25.	205.	-75.
111906Z	12.5	127.8	55	12.7	127.9	55.	13.	0.	13.4	126.0	50.	82.	-25.	14.0	124.0	50.	105.	-45.	14.2	122.0	45.	236.	-60.
111912Z	12.2	127.8	60	12.2	127.2	55.	35.	-5.	12.9	125.2	55.	82.	-25.	13.6	123.3	50.	133.	-50.	13.8	121.1	40.	299.	-65.
111918Z	12.1	127.6	65	12.4	127.2	55.	30.	-10.	12.7	125.7	60.	46.	-25.	13.4	123.7	50.	122.	-50.	13.8	121.6	40.	285.	-70.
112000Z	12.2	127.5	70	12.2	127.5	65.	0.	-5.	12.5	126.2	70.	60.	-20.	13.2	124.2	65.	131.	-35.	13.8	121.6	60.	311.	-50.
112006Z	12.7	127.2	75	12.3	127.4	70.	27.	-5.	13.0	126.0	80.	55.	-15.	13.9	122.9	75.	193.	-30.	14.0	119.8	70.	412.	-50.
112012Z	12.9	126.6	80	12.8	126.6	85.	6.	5.	13.5	123.1	80.	146.	-20.	14.2	119.9	70.	358.	-35.	15.8	116.4	85.	569.	-40.
112018Z	13.2	126.3	85	13.2	126.1	90.	12.	5.	13.9	122.6	80.	168.	-20.	14.2	119.7	70.	377.	-40.	15.5	116.2	85.	569.	-35.
112100Z	13.5	126.1	90	13.5	126.1	90.	0.	0.	14.5	124.3	100.	79.	0.	14.9	121.7	95.	279.	-15.	15.0	118.8	85.	419.	-25.
112106Z	13.9	125.8	95	14.1	125.6	90.	17.	-5.	15.2	123.1	100.	162.	-5.	16.4	120.1	80.	357.	-40.	18.4	117.6	85.	448.	-15.
112112Z	14.2	125.5	100	14.2	125.3	100.	12.	0.	15.2	123.3	110.	152.	5.	15.6	120.8	85.	322.	-40.	17.7	118.2	95.	401.	0.
112118Z	14.6	125.4	100	14.8	125.4	105.	12.	5.	15.5	123.3	105.	154.	-5.	15.5	120.9	85.	307.	-35.	17.6	118.3	90.	377.	5.
112200Z	14.9	125.6	100	14.8	125.5	100.	8.	0.	14.8	124.8	95.	125.	-15.	15.0	122.8	85.	220.	-25.	15.9	120.4	65.	274.	-10.
112206Z	15.3	125.9	105	15.3	125.6	95.	17.	-10.	16.7	125.5	85.	46.	-35.	18.4	124.6	75.	66.	-25.	20.0	123.4	65.	138.	0.
112212Z	15.6	125.9	105	15.6	125.9	90.	0.	-15.	17.7	126.1	75.	42.	-50.	21.7	128.4	65.	320.	-30.	24.0	134.0	55.	633.	0.
112218Z	16.1	125.9	110	16.0	126.0	85.	8.	-25.	18.1	126.2	75.	51.	-45.	20.7	128.3	65.	264.	-20.	23.9	134.0	55.	603.	5.
112300Z	16.3	126.3	110	16.4	126.2	85.	8.	-25.	18.3	127.3	75.	108.	-35.	21.1	129.2	65.	319.	-10.	24.1	135.0	55.	694.	5.
112306Z	16.8	126.3	120	16.8	126.4	120.	6.	0.	18.6	127.4	130.	129.	30.	21.2	129.3	130.	328.	65.	24.1	135.0	100.	704.	55.
112312Z	17.0	126.2	125	17.0	126.2	120.	0.	-5.	18.8	126.3	120.	110.	25.	21.6	128.1	110.	283.	55.	24.5	134.1	100.	705.	60.
112318Z	17.3	125.9	120	17.2	126.0	125.	8.	5.	19.0	126.4	140.	116.	55.	21.8	128.2	130.	272.	80.	24.6	134.5	120.	796.	85.
112400Z	17.5	125.6	110	17.5	125.7	115.	6.	5.	19.0	125.8	105.	91.	30.	21.5	128.0	95.	288.	45.	24.4	133.7	75.	789.	45.
112406Z	17.6	125.4	100	17.6	125.3	110.	6.	10.	18.9	125.0	100.	59.	35.	21.4	126.9	95.	270.	50.	0.0	0.0	0.	-0.	0.
112412Z	17.3	125.2	95	17.4	125.3	100.	8.	5.	18.6	125.6	90.	69.	35.	21.0	127.8	80.	316.	40.	0.0	0.0	0.	-0.	0.
112418Z	17.7	124.9	85	17.9	125.1	90.	17.	5.	18.8	124.3	80.	39.	30.	19.7	123.0	65.	261.	30.	0.0	0.0	0.	-0.	0.
112500Z	17.9	124.7	75	17.8	124.1	75.	35.	0.	18.2	123.5	65.	52.	15.	18.7	121.8	55.	324.	25.	0.0	0.0	0.	-0.	0.
112506Z	18.0	124.6	65	18.0	124.6	70.	0.	5.	18.2	123.4	60.	88.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112512Z	18.4	124.4	55	18.2	124.2	60.	17.	5.	18.6	123.0	40.	166.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112518Z	18.5	124.9	50	18.4	123.4	55.	86.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112600Z	18.1	124.4	50	18.1	124.2	40.	11.	-10.	18.6	123.0	30.	286.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112606Z	17.4	124.7	45	18.0	124.7	40.	36.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112612Z	16.5	124.9	40	16.8	124.8	40.	19.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112618Z	15.5	124.2	35	15.8	124.8	35.	39.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112700Z	14.2	124.9	30	14.2	124.9	30.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	16.	117.	267.	459.	17.	112.	265.	446.
AVG RIGHT ANGLE ERROR	10.	54.	160.	343.	10.	53.	160.	332.
AVG INTENSITY MAGNITUDE ERROR	5.	21.	36.	38.	5.	21.	37.	37.
AVG INTENSITY BIAS	-2.	-4.	-10.	-17.	-2.	-4.	-11.	-20.
NUMBER OF FORECASTS	38	33	30	26	37	32	29	25

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2214. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 7. KNOTS

TYPHOON ORCHID
FIX POSITIONS FOR CYCLONE NO. 20

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	140432	12.9N 146.4E	PCN 6			PGTW
2	141200	14.0N 147.2E	PCN 6			PGTW
3	141600	13.2N 146.8E	PCN 6	T1.0/1.0	INIT OBS	PGTW
4	141800	13.1N 146.6E	PCN 6			PGTW
* 5	142141	11.8N 142.6E	PCN 3			PGTW
* 6	150000	11.7N 142.3E	PCN 4			PGTW
* 7	150300	11.7N 142.0E	PCN 6	T0.5/0.5	INIT OBS	PGTW
8	151800	12.7N 143.2E	PCN 6	T1.0/1.0 /S0.0/26HRS	ULCC FIX	PGTW
9	152300	11.4N 141.6E	PCN 5		ULCC AT 12.6N 142.8E	PGTW
10	160300	11.4N 141.1E	PCN 6	T1.5/1.5 /D1.0/24HRS		PGTW
11	160600	10.3N 141.2E	PCN 6			PGTW
12	160900	9.5N 140.5E	PCN 6			PGTW
13	161200	9.2N 139.6E	PCN 6			PGTW
14	161600	9.3N 139.0E	PCN 6	T1.5/1.5 /D0.5/22HRS	ULCC FIX	PGTW
15	161834	9.5N 138.5E	PCN 5		ULCC FIX	PGTW
16	162100	10.0N 138.1E	PCN 6			PGTW
17	162239	9.7N 136.3E	PCN 5			PGTW
18	170000	9.7N 136.0E	PCN 6			PGTW
19	170300	9.7N 135.3E	PCN 6	T1.5/1.5 /S0.0/24HRS	ULCC FIX	PGTW
20	170537	9.8N 135.4E	PCN 5		ULCC FIX	PGTW
21	171200	12.1N 132.6E	PCN 6			PGTW
22	171600	12.5N 131.2E	PCN 6	T3.0/3.0 /D1.5/24HRS		PGTW
23	171821	12.4N 131.1E	PCN 6			PGTW
24	172103	13.0N 130.1E	PCN 5			PGTW
25	172104	12.8N 131.7E	PCN 5			RPMK
26	180000	12.7N 130.1E	PCN 6			PGTW
27	180300	13.3N 129.5E	PCN 6	T2.5/2.5 /D1.0/24HRS		PGTW
28	180600	13.5N 128.9E	PCN 6			PGTW
29	180707	13.6N 128.9E	PCN 5			PGTW
30	180900	13.5N 128.9E	PCN 6			PGTW
31	181200	13.3N 128.1E	PCN 6			PGTW
* 32	181600	12.7N 127.3E	PCN 6	T3.0/3.0-/S0.0/24HRS		PGTW
33	181800	12.4N 127.5E	PCN 6			PGTW
34	182100	12.8N 127.7E	PCN 6			PGTW
35	182336	12.7N 128.2E	PCN 5			PGTW
36	182336	12.2N 128.5E	PCN 5	T3.0/3.0	INIT OBS	RPMK
37	190300	12.7N 128.0E	PCN 6	T3.0/3.0-/D0.5/24HRS		PGTW
38	190654	12.7N 127.2E	PCN 5			PGTW
39	190900	12.4N 127.4E	PCN 6			PGTW
40	191200	12.0N 127.2E	PCN 6			PGTW
41	191600	12.2N 127.3E	PCN 6	T3.5/3.5-/D0.5/24HRS		PGTW
42	191800	12.7N 127.2E	PCN 6			PGTW
43	191939	12.2N 127.5E	PCN 5			RPMK
44	192100	12.3N 126.9E	PCN 6			PGTW
45	192203	12.1N 127.5E	PCN 3			PGTW
46	192314	12.3N 127.4E	PCN 3			PGTW
47	192314	12.1N 127.4E	PCN 3	T3.0/3.0	INIT OBS	RODN
48	200300	12.3N 127.2E	PCN 4	T4.0/4.0-/D1.0/24HRS		PGTW
49	200642	12.4N 127.4E	PCN 1			PGTW
50	201013	12.9N 126.9E	PCN 1			PGTW
51	201043	12.8N 127.2E	PCN 1			RODN
52	201200	12.8N 126.6E	PCN 2			PGTW
53	201600	13.1N 126.4E	PCN 4	T4.5/4.5-/D1.5/24HRS		PGTW
54	201800	13.2N 126.1E	PCN 4			PGTW
55	201927	13.5N 126.3E	PCN 3			PGTW
56	202100	13.3N 126.0E	PCN 4			PGTW
57	202142	13.2N 126.1E	PCN 4			PGTW
58	202252	13.1N 126.8E	PCN 3			PGTW
59	202252	13.2N 126.1E	PCN 3	T4.0/4.0 /D1.0/24HRS		RODN
60	210300	13.9N 125.6E	PCN 2			PGTW
61	210629	14.2N 125.7E	PCN 1	T5.0/5.0	INIT OBS	RPMK
62	210629	14.2N 125.6E	PCN 3	T4.5/4.5-/D0.5/27HRS		PGTW
63	210900	14.4N 125.3E	PCN 2			PGTW
64	211022	14.3N 125.3E	PCN 4			PGTW
65	211200	14.5N 125.3E	PCN 2			PGTW
66	211600	14.5N 125.4E	PCN 2	T5.0/5.0	INIT OBS	PGTW
67	211800	14.9N 125.6E	PCN 2			PGTW
68	211914	14.9N 125.6E	PCN 1			PGTW
69	211914	14.8N 125.5E	PCN 1			RODN
70	212121	15.0N 125.3E	PCN 5		ULCC FIX	PGTW
71	220000	15.0N 125.4E	PCN 6		ULCC FIX	PGTW
72	220012	14.7N 125.7E	PCN 1	T5.0/5.0 /S0.0/18HRS		RPMK
73	220300	15.1N 125.7E	PCN 2	T5.0/5.0 /D0.5/21HRS	EYE DIA 25NM	PGTW
74	220600	15.4N 125.6E	PCN 2			PGTW
75	220617	15.3N 125.7E	PCN 3	T5.0/5.0 /S0.0/24HRS		RPMK
76	220900	15.5N 125.7E	PCN 4			PGTW
77	221200	15.6N 125.9E	PCN 4			PGTW
78	221600	16.0N 125.9E	PCN 4	T4.5/5.0-/W0.5/24HRS		PGTW
79	221800	16.1N 126.1E	PCN 4			PGTW

80	222100	16.4N 126.2E	PCN 2			PGTW
81	230000	16.4N 126.4E	PCN 2		EYE DIA 18NM	PGTW
82	230300	16.6N 126.3E	PCN 2	T5.0/5.0 /S0.0/24HRS	EYE DIA 15NM	PGTW
83	230605	16.8N 126.3E	PCN 1		EYE DIA 20NM	PGTW
84	230605	16.9N 126.3E	PCN 1	T4.5/4.5	INIT OBS	RODN
85	230940	17.1N 126.2E	PCN 1			PGTW
86	231200	17.1N 126.1E	PCN 2			PGTW
87	231600	17.2N 125.9E	PCN 2	T6.5/6.5-/D2.0/24HRS		PGTW
88	231849	17.3N 125.8E	PCN 1			PGTW
89	232100	17.4N 125.8E	PCN 2		EYE DIA 36NM	PGTW
90	232220	17.5N 126.2E	PCN 1			RODN
91	232320	17.5N 125.7E	PCN 1	T5.5/5.5-/D0.5/21HRS	EYE DIA 20NM	PGTW
* 92	232320	17.5N 125.6E	PCN 1	T6.0/6.0 /D1.0/24HRS		RPMK
93	240300	17.6N 125.5E	PCN 2		EYE DIA 20NM	PGTW
94	240552	17.0N 125.3E	PCN 1	T5.5/6.0 /W0.5/30HRS		RPMK
95	240600	17.6N 125.3E	PCN 2			PGTW
96	240900	17.6N 125.2E	PCN 2			PGTW
97	241027	17.6N 125.1E	PCN 1			PGTW
98	241100	17.4N 125.7E	PCN 3			RPMK
99	241200	17.7N 124.9E	PCN 4			PGTW
100	241600	17.9N 124.8E	PCN 4	T5.0/5.5 /W1.5/24HRS		PGTW
101	241837	18.0N 125.0E	PCN 4			PGTW
102	242150	18.0N 125.0E	PCN 6			PGTW
103	242159	18.1N 124.9E	PCN 5	T5.0/6.0 /W1.0/23HRS		RPMK
104	242306	17.9N 125.0E	PCN 4	T4.0/5.0-/W1.5/24HRS		PGTW
105	242306	17.7N 124.9E	PCN 3	T4.5/5.5 /W1.5/24HRS		RPMK
106	250600	18.0N 124.6E	PCN 4			PGTW
107	250721	17.8N 124.9E	PCN 3	T3.5/3.5	INIT OBS EXP LLCC	RODN
108	251039	18.5N 124.8E	PCN 5			RPMK
109	252130	18.2N 124.6E	PCN 3			PGTW
110	252245	18.2N 125.0E	PCN 5			RODN
111	260000	17.9N 124.6E	PCN 4			PGTW
112	260300	18.3N 125.4E	PCN 6	T2.5/3.5-/W1.5/28HRS		PGTW
113	260600	17.5N 124.9E	PCN 6			PGTW
114	261124	16.2N 125.4E	PCN 5			RPMK

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/	IN/	DP/	SST	MSN NO.
1	180044	12.5N 130.5E	1500FT		1002	30 260 70	040 35 320 40	6 6				+23		30	3
2	180834	13.0N 129.2E	700MB	3056	994	40 020 60	110 49 040 90	10 8			+11	+13	+11		4
3	181103	12.6N 128.8E	700MB	3040			040 55 310 102	10 10							4
4	182120	12.5N 128.2E	1500FT		986	50 210 15	320 59 210 15	20 2				+28	+26	29	5
5	190023	12.0N 128.1E	700MB	3008	989	40 130 40	040 55 310 68	15 9			+16	+18	+ 8		5
6	190754	12.5N 127.8E	700MB	2891	981	40 030 40	130 50 020 51	10 3				+18	+ 8		6
7	191035	12.1N 127.7E	700MB	2888			040 56 340 30	10 5							6
8	192110	12.2N 127.5E	700MB	2858		45 030 60	140 63 050 15	6 3	CIRCULAR	20	+17	+17	+10		7
9	192336	12.1N 127.5E	700MB	2832	970	65 270 90	290 76 180 17	7 2	CIRCULAR	20	+11	+17	+10		7
10	200834	12.8N 127.2E	700MB	2710		80 050 10	330 78 240 16	12 4	CIRCULAR	25	+12	+16	+12		8
11	201134	12.8N 126.7E	700MB	2684	954		210 80 130 18	8 4	CIRCULAR	22	+13	+18	+14		8
12	202050	13.6N 126.2E	700MB	2632			020 75 310 18	15 4							9
13	202319	13.5N 126.2E	700MB	2648	950	80 080 15	170 80 080 90	15 5	CIRCULAR	20	+10	+14	+14		9
14	210932	14.1N 125.5E	700MB	2588		45 180 90	030 89 320 30	10 2							10
15	211110	14.2N 125.4E	700MB	2581	942		160 105 100 23	10 2	CIRCULAR	30	+17	+16	+13		10
16	212033	14.8N 125.5E	700MB	2568			350 105 240 23	12 2	CIRCULAR	17	+14	+18	+15		11
17	212326	14.8N 125.6E	700MB	2590	943	80 070 20	140 93 070 20	8 5			+13	+16	+15		11
18	220917	15.4N 126.0E	700MB	2655		50 270 90	360 91 270 17	12 2			+13	+17	+ 5		12
19	221156	15.6N 125.8E	700MB	2665			150 83 070 20	10 3	CIRCULAR	30	+13	+19	+10		12
20	222032	16.2N 126.1E	700MB	2614		60 090 120	140 94 090 22	6 4	CIRCULAR	17	+15	+16	+10		13
21	222302	16.2N 126.3E	700MB	2632	947	70 310 60	040 93 310 16	8 3	CIRCULAR	20	+15	+18	+15		13
22	230833	17.0N 126.2E	700MB	2491		120 040 10	360 104 290 24	10 2	CIRCULAR	25	+13	+17	+15		14
23	231110	16.0N 126.2E	700MB	2501	933		060 110 330 18	8 2	CIRCULAR	25	+14	+18	+15		14
24	232031	17.3N 125.9E	700MB	2460			200 115 100 29	10 3	CIRCULAR	25	+15	+17			15
25	232256	17.4N 125.7E	700MB	2457	931	55 360 60	060 102 350 21	10 3	CIRCULAR	25	+11	+19			15
26	240836	17.5N 125.3E	700MB	2583	941	80 260 60	130 85 050 25	8 2	CIRCULAR	15	+16	+18	+14		16
27	241109	17.3N 125.3E	700MB	2636			020 96 300 31	8 2			+10	+19	+14		16
28	242030	17.8N 124.8E	700MB	2791			200 70 100 65	6 5			+13	+15	+15		17
29	242301	17.9N 124.8E	700MB	2828		45 040 30	030 63 300 37	6 5	CIRCULAR	25	+10	+16	+13		17
30	250856	18.0N 124.6E	700MB	2961	988	65 220 40	330 51 270 15	6 2			+15	+16	+11		18
31	251139	18.3N 124.4E	700MB	3001	992		080 55 320 60	6 3			+13	+15	+10		18
32	252110	18.2N 124.8E	700MB	3047			180 53 050 60	6 5			+13	+12	+10		19
33	252340	18.2N 124.3E	700MB	3086	1005	25 130 120	070 39 330 64	5 8			+12	+14	+10		19
34	260930	17.2N 124.8E	850MB			50 310 100	070 44 310 70	5 5				+20	+16		20
35	261144	16.7N 124.8E	850MB				010 64 220 80	5 5			+24	+23	+15		20
36	262045	15.1N 124.2E	700MB	3089		15 130 90	010 30 260 105	10 9				+10	+10		21
37	262342	14.2N 124.9E	1500FT		1006	55 310 85	050 42 020 115	10 13			+23	+24	+24	28	21

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
* 1	190000	13.5N 127.6E	LAND				5///2 42713		14.0N 124.3E	98447

*	2	190130	13.6N	127.1E	LAND	5///2	42923		14.0N	124.3E	98447
*	3	190200	13.7N	126.8E	LAND	5///2	43226		14.0N	124.3E	98447
*	4	190330	13.8N	126.6E	LAND	5///2	42711		14.0N	124.3E	98447
*	5	190400	13.8N	126.6E	LAND	5///2	40000		14.0N	124.3E	98447
*	6	190600	13.6N	126.5E	LAND	5///2	42220		14.0N	124.3E	98447
*	7	190700	13.6N	126.5E	LAND	5///2	40000		14.0N	124.3E	98447
	8	190800	12.7N	127.3E	LAND	5///3	40000		14.0N	124.3E	98447
	9	191000	12.6N	127.0E	LAND	5///2	42205		14.0N	124.3E	98447
	10	191100	12.3N	126.9E	LAND	5///2	51916		14.0N	124.3E	98447
	11	191200	12.3N	126.9E	LAND	5///2	50000		14.0N	124.3E	98447
	12	191300	12.3N	126.9E	LAND	5///2	52704		14.0N	124.3E	98447
	13	201100	12.8N	126.9E	LAND	20503	529//		14.0N	124.3E	98447
	14	201200	12.8N	126.8E	LAND	20513	53208		14.0N	124.3E	98447
	15	201300	12.8N	126.8E	LAND	20243	52404		14.0N	124.3E	98447
	16	201400	12.8N	126.7E	LAND	10413	52508	EYE CIR 50 PCT OPEN NE	14.0N	124.3E	98447
	17	201500	12.8N	126.7E	LAND	10323	40000	EYE CIR 50 PCT OPEN NE	14.0N	124.3E	98447
	18	210000	13.5N	126.2E	LAND	/////	53405		14.0N	124.3E	98447
	19	210100	13.6N	126.1E	LAND	10413	52708		14.0N	124.3E	98447
	20	210400	13.8N	125.8E	LAND	10513	52705	EYE CIR 40 PCT OPEN NNE	14.0N	124.3E	98447
	21	210800	14.3N	125.7E	LAND	10893	52703		14.0N	124.3E	98447
	22	211000	14.4N	125.5E	LAND	10813	52708		14.0N	124.3E	98447
	23	211400	14.2N	125.5E	LAND	10713	51506	EYE CIR 40 PCT OPEN NNE	14.0N	124.3E	98447
	24	211500	14.4N	125.6E	LAND	10713	50210	EYE CIR 40 PCT OPEN NNE	14.0N	124.3E	98447
	25	212200	14.9N	125.6E	LAND	10713	40000		14.0N	124.3E	98447
*	26	212300	14.8N	124.8E	LAND	4////	/////		18.3N	121.6E	98321
	27	220100	14.8N	125.7E	LAND	10713	51209		14.0N	124.3E	98447
	28	220200	14.8N	125.6E	LAND	10743	52704		14.0N	124.3E	98447
	29	220300	14.9N	125.7E	LAND	10713	50507		14.0N	124.3E	98447
	30	220500	15.1N	125.8E	LAND	10713	53505		14.0N	124.3E	98447
	31	220800	15.3N	126.0E	LAND	10613	50911		14.0N	124.3E	98447
	32	221000	15.4N	126.1E	LAND	50405	/////		14.0N	124.3E	98447
	33	221100	15.5N	126.2E	LAND	2/612	53608		14.0N	124.3E	98447
	34	221200	15.5N	126.3E	LAND	2/612	50408		14.0N	124.3E	98447
	35	250700	18.1N	124.3E	LAND	///2/	4////		18.3N	121.6E	98231
	36	250800	18.1N	124.3E	LAND	///2/	4////		18.3N	121.6E	98231
	37	251500	18.4N	124.0E	LAND	5////	53001		18.3N	121.6E	98231
	38	251600	18.4N	123.9E	LAND	5////	53001		18.3N	121.6E	98231
	39	251800	18.4N	123.8E	LAND	5////	52703		18.3N	121.6E	98231
	40	251900	18.4N	123.7E	LAND	5////	52905		18.3N	121.6E	98231
	41	252100	18.5N	123.4E	LAND	21602	52717		18.3N	121.6E	98231
	42	252200	18.5N	123.1E	LAND	21612	52717		18.3N	121.6E	98231
	43	252300	18.6N	123.0E	LAND	25552	53315		18.3N	121.6E	98231
	44	270600	13.4N	124.7E	LAND	2////	52205		14.0N	124.3E	98447

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON PERCY
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		WIND	WARNING POSIT		WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND
111700Z	10.5	110.0	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111706Z	10.0	111.0	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111712Z	9.8	111.0	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111718Z	9.6	111.1	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111800Z	9.5	111.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111806Z	9.0	111.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111812Z	8.6	112.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111818Z	8.6	112.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111900Z	8.9	113.1	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111906Z	8.7	112.7	45	8.7	112.8	45.	6.	0.	9.6	111.7	50.	130.	-15.	10.3	110.3	45.	105.	-15.	12.0	108.0	25.	380.	-15.
111912Z	8.1	112.6	50	8.3	112.6	60.	12.	10.	8.6	110.9	65.	83.	-5.	9.2	109.5	60.	100.	5.	10.0	107.2	55.	380.	20.
111918Z	7.5	112.4	55	8.8	111.3	60.	102.	5.	9.9	109.4	65.	100.	0.	10.6	108.0	50.	312.	0.	11.4	106.5	30.	409.	-5.
112000Z	7.4	111.8	60	7.5	111.7	60.	8.	0.	7.9	110.0	55.	97.	-5.	9.5	107.7	50.	316.	5.	11.0	105.6	45.	563.	10.
112006Z	7.3	111.6	65	8.1	111.2	65.	54.	0.	8.9	110.2	65.	123.	5.	9.0	108.2	65.	309.	25.	10.3	104.0	55.	653.	25.
112012Z	7.3	111.4	70	7.3	111.5	75.	6.	5.	7.5	110.3	85.	101.	30.	8.7	108.7	80.	283.	45.	10.0	107.1	65.	567.	35.
112018Z	7.4	111.3	65	7.5	111.0	75.	19.	10.	8.3	109.2	80.	109.	30.	9.4	107.6	70.	392.	35.	10.7	106.0	30.	676.	5.
112100Z	7.6	111.6	60	7.6	111.5	75.	6.	15.	8.0	110.9	60.	100.	15.	9.0	109.2	50.	333.	15.	10.2	106.5	50.	720.	25.
112106Z	7.6	111.8	60	7.7	111.6	70.	13.	10.	7.5	111.2	50.	109.	10.	8.5	109.0	40.	390.	10.	9.5	106.3	30.	816.	5.
112112Z	7.5	112.0	55	7.5	112.0	60.	0.	5.	7.3	111.0	50.	147.	15.	8.6	108.7	40.	469.	10.	9.3	106.2	30.	905.	10.
112118Z	7.6	112.3	50	7.5	111.5	60.	48.	10.	8.0	109.4	50.	279.	15.	8.5	107.5	40.	590.	15.	9.2	104.2	30.	1009.	10.
112200Z	7.7	112.7	45	7.8	112.7	50.	6.	5.	7.7	111.4	40.	209.	5.	7.8	110.7	35.	499.	10.	0.0	0.0	0.	-0.	0.
112206Z	7.8	113.0	40	7.8	112.8	45.	12.	5.	7.7	112.0	35.	226.	5.	7.7	111.0	30.	575.	5.	0.0	0.0	0.	-0.	0.
112212Z	7.9	113.4	35	7.8	113.4	40.	6.	5.	8.0	113.9	35.	160.	5.	9.0	111.9	30.	583.	10.	0.0	0.0	0.	-0.	0.
112218Z	8.2	114.1	35	8.1	113.9	40.	13.	5.	9.0	112.6	35.	286.	10.	9.1	110.7	30.	717.	10.	0.0	0.0	0.	-0.	0.
112300Z	8.6	114.8	35	8.4	114.9	35.	13.	0.	13.0	121.0	25.	206.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112306Z	8.6	115.7	30	9.2	115.4	35.	40.	5.	11.4	117.5	35.	147.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112312Z	8.8	116.6	30	8.8	116.6	35.	0.	5.	11.6	118.0	30.	195.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112318Z	9.6	117.4	25	9.4	117.3	35.	13.	10.	13.2	117.6	30.	285.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112400Z	10.4	118.7	25	10.3	118.3	30.	24.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112406Z	11.3	120.0	25	11.4	119.2	30.	47.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112412Z	12.0	121.3	20	12.3	121.2	25.	19.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112418Z	12.4	122.4	20	12.5	122.5	20.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	21.	173.	409.	660.	20.	140.	289.	457.
AVG RIGHT ANGLE ERROR	11.	86.	184.	361.	9.	80.	207.	350.
AVG INTENSITY MAGNITUDE ERROR	5.	11.	14.	15.	6.	13.	10.	13.
AVG INTENSITY BIAS	5.	0.	12.	11.	6.	0.	14.	3.
NUMBER OF FORECASTS	23	19	15	11	16	12	8	4

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1123. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 6. KNOTS

TYPHOON PERCY
FIX POSITIONS FOR CYCLONE NO. 21

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	181200	8.6N 112.0E	PCN 6		ULCC FIX	PGTW
2	181600	8.7N 112.9E	PCN 6	T1.0/1.0	INIT OBS	PGTW
3	182100	8.8N 113.1E	PCN 6			PGTW
4	182336	8.7N 113.3E	PCN 5	T2.5/2.5	INIT OBS	PGTW
5	182336	9.9N 113.1E	PCN 5	T3.0/3.0	INIT OBS	RPMK
6	190300	8.8N 112.8E	PCN 6			PGTW
7	190600	8.7N 112.4E	PCN 6			PGTW
* 8	190900	8.7N 111.6E	PCN 6			PGTW
9	191104	8.0N 112.6E	PCN 3	T3.0/3.0 /S0.0/12HRS		RPMK
* 10	191200	9.0N 111.4E	PCN 6			PGTW
11	191216	8.3N 112.2E	PCN 5		ULCC FIX	RODN
* 12	191600	8.9N 111.0E	PCN 6	T3.0/3.0	INIT OBS	PGTW
* 13	191800	9.3N 111.5E	PCN 6			PGTW
14	191939	7.5N 111.6E	PCN 5			RPMK
* 15	192100	8.9N 111.6E	PCN 6			PGTW
16	192203	7.4N 111.2E	PCN 5			PGTW
17	200000	7.5N 111.4E	PCN 6			PGTW
* 18	200056	8.3N 111.0E	PCN 3	T4.0/4.0-/D1.0/22HRS		RPMK

19	200300	7.4N 111.4E	PCN 4	T4.0/4.0-/D1.0/24HRS		PGTW
20	200600	7.7N 111.2E	PCN 4			PGTW
21	200824	7.3N 111.2E	PCN 3			RPMK
22	200900	7.7N 111.0E	PCN 6			PGTW
23	201043	7.1N 110.7E	PCN 5			RODN
* 24	201154	7.3N 110.4E	PCN 3			RODN
25	201154	7.2N 111.2E	PCN 5			RPMK
26	201200	7.5N 111.3E	PCN 6			PGTW
27	201600	8.0N 111.1E	PCN 6	T4.5/4.5-/D1.5/24HRS		PGTW
28	201800	8.3N 111.0E	PCN 6			PGTW
29	202100	7.5N 110.9E	PCN 6			PGTW
30	202323	7.4N 111.1E	PCN 5	T4.0/4.0 /S0.0/23HRS		RPMK
31	210000	7.5N 111.7E	PCN 6			PGTW
32	210300	7.7N 110.8E	PCN 6			PGTW
33	210600	7.7N 111.7E	PCN 6	T3.0/4.0 /W1.0/27HRS		PGTW
34	210811	7.2N 112.1E	PCN 3	T3.0/4.0-/W1.0/24HRS		RPMK
35	210900	7.9N 111.8E	PCN 6		EXP LLCC	PGTW
36	211132	7.3N 111.2E	PCN 5			RPMK
37	211200	7.6N 111.6E	PCN 6		ULCC FIX	PGTW
* 38	211600	7.6N 111.1E	PCN 6	T2.5/3.5-/W2.0/24HRS		PGTW
* 39	211800	8.0N 110.6E	PCN 6			PGTW
40	212302	7.0N 112.7E	PCN 3	T2.5/3.5 /W1.5/24HRS		PGTW
41	212302	7.0N 112.7E	PCN 3	T2.5/3.5 /W1.5/24HRS		RPMK
42	220000	7.7N 112.7E	PCN 4			PGTW
43	220012	7.7N 112.9E	PCN 3	T2.0/2.0	INIT OBS	RODN
44	220012	7.7N 112.7E	PCN 3			RPMK
45	220300	7.8N 112.8E	PCN 4	T2.0/3.0 /W1.0/21HRS		PGTW
46	220600	7.8N 112.9E	PCN 4		EXP LLCC	PGTW
47	220759	7.5N 113.1E	PCN 3			RPMK
48	220900	7.8N 113.1E	PCN 6		EXP LLCC	PGTW
49	221200	7.9N 113.4E	PCN 6		EXP LLCC	PGTW
50	221600	7.7N 113.9E	PCN 6	T1.5/2.5 /W1.0/24HRS		PGTW
51	221800	8.2N 113.8E	PCN 6			PGTW
52	222100	8.5N 113.5E	PCN 6		ULCC 8.5N 112.1E	PGTW
53	222241	8.3N 114.9E	PCN 3	T[illegible].0/2.5+/W0.5/24HRS		RPMK
54	222350	8.7N 115.0E	PCN 3	T1.0/2.0 /W1.0/24HRS		RODN
55	222350	8.5N 114.8E	PCN 3			RPMK
56	230000	8.5N 115.2E	PCN 4	T2.0/2.0 /S0.0/21HRS		PGTW
57	230000	8.3N 114.7E	PCN 6			PGTW
58	230300	8.9N 115.1E	PCN 6			PGTW
59	230600	8.6N 115.6E	PCN 4		EXP LLCC	PGTW
60	230746	9.0N 115.9E	PCN 3			RODN
61	230746	8.6N 116.7E	PCN 3			RPMK
62	230900	8.8N 116.1E	PCN 6		EXP LLCC	PGTW
63	231121	8.4N 116.4E	PCN 5			RPMK
64	231200	8.8N 116.6E	PCN 6		EXP LLCC	PGTW
65	231600	8.9N 116.9E	PCN 6	T0.5/1.5 /W1.0/24HRS		PGTW
66	231800	9.4N 117.4E	PCN 6			PGTW
67	232100	9.6N 117.5E	PCN 6			PGTW
68	232320	10.6N 118.6E	PCN 5	T1.0/2.0 /W1.0/24HRS		PGTW
69	232328	8.2N 117.5E	PCN 5	T1.0/2.0 /W1.0/24HRS		RPMK
70	240300	10.6N 119.3E	PCN 6			PGTW
71	240600	11.0N 119.6E	PCN 6			PGTW
72	241100	10.9N 121.1E	PCN 5		ULCC FIX	RODN
73	241100	10.7N 121.1E	PCN 5		ULCC FIX	RPMK
74	241600	11.0N 121.3E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG			MAX-FLT-LVL-WND DIR/VEL/BRG/RNG				ACCRY NAV/MET		EYE SHAPE	EYE DIAM/ORIEN-TATION			EYE TEMP (C) OUT/ IN/ DP/SST			MSN NO.
1	191042	8.2N 112.6E	700MB	2976	986	60	150	30	000	49	340	22	10	5	CIRCULAR	40			+14	+16	+ 6	1
2	192136	7.3N 112.3E	700MB	2956	985				140	51	040	30	15	5								2
3	192331	7.4N 112.0E	700MB	2934	981	65	140	12	220	54	140	30	15	3	ELLIPTICAL	15	10	100	+13	+20	+10	2
4	200905	7.2N 111.5E	700MB	2843		55	270	5	120	79	030	30	15	5	CIRCULAR	20			+20	+10	+ 9	3
5	201135	7.2N 111.5E	700MB	2857	971				250	76	100	35	15	2	ELLIPTICAL	20	15	110	+17	+10	+10	3
6	202041	7.4N 111.3E	700MB	2876					160	68	060	18	10	3	ELLIPTICAL	15	7	320	+14	+16	+10	4
7	202344	7.6N 111.6E	700MB	2959	985	80	150	33	190	63	120	60	22	3					+15	+17	+11	4
8	210950	7.5N 112.0E	700MB	2970	986	60	240	10	050	50	320	60	12	3					+13	+15	+ 9	5
9	211142	7.7N 111.9E	700MB	2960	986				270	49	210	30	12	3					+11	+15	+ 9	5
10	212239	7.7N 112.7E	700MB	2993	991	15	100	120	230	47	130	30	10	12					+16	+15	+ 9	6
11	220045	7.9N 113.1E	1500FT	3055	997	30	250	60	340	50	260	39	6	6						+20	+20	7
12	221126	7.0N 113.3E	700MB	3074	1002				260	40	150	30	6	3						+13	+10	7
13	230241	8.0N 114.0E	1500FT		1004	35	060	40	180	27	060	90	6	5					+24	+25	+19	8

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM RUTH
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		BEST TRACK WIND	WARNING POSIT		WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT		24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT		48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT		72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
112106Z	7.5	145.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112112Z	7.8	144.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112118Z	8.0	143.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112200Z	8.1	142.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112206Z	8.2	142.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112212Z	8.3	141.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112218Z	8.6	141.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112300Z	9.0	140.3	30	9.2	140.2	30.	13.	0.	11.4	136.7	45.	257.	25.	14.9	134.3	65.	433.	45.	19.2	134.2	55.	405.	35.
112306Z	9.3	140.4	30	9.4	140.6	30.	13.	0.	10.9	136.8	45.	215.	25.	14.1	135.1	65.	342.	45.	18.7	136.0	65.	378.	45.
112312Z	9.1	140.9	30	9.2	140.9	30.	6.	0.	10.0	139.7	45.	110.	25.	13.0	138.2	60.	256.	40.	16.0	137.4	65.	359.	45.
112318Z	8.6	140.5	30	8.9	140.8	30.	25.	0.	10.4	139.5	50.	134.	25.	13.4	138.1	60.	308.	40.	17.6	137.3	70.	435.	50.
112400Z	8.4	139.8	20	8.4	139.9	20.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112406Z	8.4	139.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112412Z	8.4	138.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112418Z	8.5	138.3	25	0.0	0.0	0.	-0.	3.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112500Z	8.6	137.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112506Z	8.9	137.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112512Z	10.1	135.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112518Z	11.8	133.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112600Z	12.7	132.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112606Z	13.7	132.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112612Z	14.5	131.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112618Z	15.1	130.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112700Z	15.6	129.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112706Z	16.0	129.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112712Z	16.5	129.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112718Z	17.0	128.8	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112800Z	17.4	128.6	55	17.3	128.7	55.	8.	0.	18.9	127.3	55.	50.	5.	19.8	125.5	50.	78.	15.	0.0	0.0	0.	-0.	0.
112806Z	17.8	128.4	60	17.7	128.4	60.	6.	0.	19.1	126.8	55.	43.	10.	20.0	124.8	50.	126.	20.	0.0	0.0	0.	-0.	0.
112812Z	18.3	128.0	60	18.2	128.1	60.	8.	0.	19.4	126.2	65.	48.	20.	20.2	123.9	60.	178.	40.	0.0	0.0	0.	-0.	0.
112818Z	18.3	127.4	60	18.3	127.6	60.	11.	0.	19.1	125.6	60.	27.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112900Z	18.3	126.7	50	18.1	126.7	50.	12.	0.	16.3	125.1	40.	135.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112906Z	18.5	126.4	45	18.2	126.5	45.	19.	0.	17.9	125.3	40.	13.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112912Z	18.6	126.1	45	18.2	126.4	45.	29.	0.	17.7	125.5	30.	8.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112918Z	18.7	125.8	40	17.8	126.1	40.	57.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
113000Z	18.5	125.6	35	18.5	125.5	35.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
113006Z	18.0	125.5	30	18.1	125.6	30.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
113012Z	17.6	125.4	20	17.6	125.2	20.	11.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	15.	94.	246.	394.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	0.	56.	162.	353.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	0.	16.	35.	44.	0.	0.	0.	0.
AVG INTENSITY BIAS	0.	16.	35.	44.	0.	0.	0.	0.
NUMBER OF FORECASTS	16	11	7	4	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1615. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 7. KNOTS

TROPICAL STORM RUTH
FIX POSITIONS FOR CYCLONE NO. 22

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	190300	4.5N 146.2E	PCN 6			PGTW
2	190900	2.9N 148.6E	PCN 6			PGTW
3	191200	5.2N 146.7E	PCN 6			PGTW
4	191600	2.7N 146.7E	PCN 6			PGTW
* 5	191800	3.2N 142.0E	PCN 6			PGTW
6	192021	4.0N 147.7E	PCN 6			PGTW
7	200000	5.9N 146.0E	PCN 6			PGTW
8	200500	7.1N 145.3E	PCN 6	T0.5/0.5		PGTW
9	200902	4.6N 147.1E	PCN 6		ULCC FIX	PGTW
10	201200	4.5N 147.9E	PCN 6		ULCC FIX	PGTW
11	201600	5.1N 148.2E	PCN 6	T1.0/1.0	INIT OBS	PGTW
12	201745	7.1N 146.1E	PCN 6			PGTW
13	210000	7.4N 145.9E	PCN 6			PGTW

14	210447	8.0N 145.4E	PCN 6	T0.5/0.5 /S0.0/26HRS		PGTW
* 15	210841	9.6N 145.1E	PCN 6			PGTW
* 16	210951	9.8N 144.8E	PCN 6			PGTW
* 17	211732	10.1N 144.1E	PCN 6	T1.5/1.5 /D0.5/26HRS		PGTW
* 18	211800	10.1N 143.8E	PCN 6			PGTW
* 19	212231	10.2N 143.3E	PCN 5		ULCC FIX	PGTW
* 20	220000	10.7N 142.9E	PCN 6		ULCC FIX	PGTW
* 21	220300	11.2N 142.6E	PCN 6	T1.5/1.5 /D1.0/23HRS	ULCC FIX	PGTW
* 22	220600	11.3N 140.8E	PCN 6		ULCC FIX	PGTW
* 23	221200	11.0N 140.5E	PCN 6		MLCC FIX	PGTW
* 24	221600	10.9N 141.1E	PCN 6	T1.0/1.5 /W0.5/24HRS		PGTW
* 25	221800	10.9N 140.9E	PCN 6			PGTW
* 26	222100	10.7N 140.5E	PCN 6			PGTW
27	230000	9.0N 140.5E	PCN 4			PGTW
28	230300	9.5N 140.1E	PCN 6	T2.5/2.5 /D1.0/24HRS		PGTW
29	230605	9.5N 139.6E	PCN 5			PGTW
30	231200	9.0N 140.9E	PCN 6			PGTW
* 31	232147	9.1N 139.4E	PCN 5		EXP LLCC	PGTW
32	240000	8.5N 139.8E	PCN 4	T1.0/2.0 /W1.5/21HRS	EXP LLCC	PGTW
33	240300	8.5N 139.5E	PCN 4		EXP LLCC	PGTW
34	241837	7.8N 138.0E	PCN 6	T1.5/1.5	INIT OBS	PGTW
* 35	242306	8.1N 136.8E	PCN 6			PGTW
* 36	250600	8.7N 136.2E	PCN 6			PGTW
37	250900	9.2N 135.8E	PCN 6			PGTW
38	251200	9.9N 135.5E	PCN 6			PGTW
39	251600	11.7N 134.5E	PCN 6		ULCC FIX	PGTW
40	251825	12.3N 132.2E	PCN 5	T2.0/2.0 /D0.5/24HRS		PGTW
* 41	260600	11.0N 132.4E	PCN 6			PGTW
42	261200	14.5N 132.2E	PCN 6			PGTW
43	261600	14.5N 130.5E	PCN 6		ULCC FIX	PGTW
44	261800	15.0N 129.9E	PCN 6		ULCC FIX	PGTW
45	270000	15.5N 129.5E	PCN 6	T1.5/1.5	INIT OBS ULCC FIX	PGTW
46	270300	15.8N 129.0E	PCN 6		ULCC FIX	PGTW
47	270600	15.7N 129.2E	PCN 6			PGTW
48	270900	15.6N 128.8E	PCN 6			PGTW
49	270956	16.1N 129.4E	PCN 6			PGTW
50	271200	16.6N 129.3E	PCN 6			PGTW
51	271600	17.1N 128.8E	PCN 6		ULCC FIX	PGTW
52	271800	17.3N 128.7E	PCN 6			PGTW
53	272055	17.5N 128.6E	PCN 6			PGTW
54	280000	17.5N 128.4E	PCN 6			PGTW
55	280300	17.6N 128.6E	PCN 4	T3.5/3.5 /D2.0/27HRS		PGTW
56	280600	17.9N 128.5E	PCN 6			PGTW
57	280644	17.9N 128.7E	PCN 5			PGTW
58	280900	18.0N 128.2E	PCN 4			PGTW
59	280935	18.1N 128.3E	PCN 4			PGTW
60	281040	18.3N 128.4E	PCN 4	T3.5/3.5	INIT OBS	PGTW
61	281040	18.3N 128.2E	PCN 3			RPMK
62	281200	18.2N 128.2E	PCN 6			PGTW
63	281600	18.3N 127.7E	PCN 4			PGTW
64	281800	18.3N 127.5E	PCN 4			PGTW
65	282100	18.3N 127.2E	PCN 6			PGTW
66	282320	18.1N 126.9E	PCN 5			PGTW
67	282320	17.9N 126.9E	PCN 5	T2.5/2.5	INIT OBS	RODN
68	290300	18.3N 126.3E	PCN 4	T3.0/3.5 /W0.5/24HRS		PGTW
69	290632	18.6N 126.4E	PCN 1			PGTW
70	290900	18.8N 126.2E	PCN 6			PGTW
71	291018	18.3N 125.7E	PCN 6	T2.0/3.0-/W1.5/24HRS		PGTW
72	292155	18.2N 125.6E	PCN 3			PGTW
73	292258	18.2N 125.6E	PCN 3	T2.0/2.0	INIT OBS EXP LLCC	RPMK
74	292258	18.3N 125.7E	PCN 3			PGTW
75	300628	17.8N 125.7E	PCN 3	T1.5/2.5-/W1.5/27HRS	EXP LLCC	PGTW
76	301138	17.8N 125.0E	PCN 5			RODN

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/	IN/	DP/	SST	MSN NO.
1	222345	9.2N 140.2E	1500FT		1004	30 220 30	120 20 090 60	8 10			+28	+26	+25		3
2	230624	9.3N 140.7E	1500FT		1000	30 280 60	090 32 030 135	7 8			+25	+27	+26	30	4
3	230807	9.2N 140.7E	1500FT		1001	20 100 80	110 30 320 120	9 8				+27	+25	33	4
* 4	232030	8.5N 138.8E	700MB	3133		15 200 30	120 20 010 90	25 25			+15	+13	+12		5
5	232335	8.4N 139.9E	1500FT		1005	10 300 60	160 14 130 30	15 15			+29	+28	+25	29	5
6	250522	8.9N 137.6E	1500FT		1004	25 240 45	230 17 240 45								6
7	272340	17.3N 128.6E	1500FT		997	60 020 26	020 44 270 31	5 1			+25	+24	+24	30	8
8	280532	17.7N 128.4E	700MB	3020	993	50 240 10	160 67 040 40	10 2							9
9	280812	17.9N 128.2E	700MB	3030	994	60 230 30	150 74 230 45	10 1	CIRCULAR	32	+14	+10	+10		9
10	282041	18.2N 126.8E	700MB	3032			140 43 030 23	6 3							10
11	282310	18.2N 126.8E	700MB	3075	997	45 300 10	140 43 060 55	6 3				+16	+ 7		10
12	290531	18.4N 126.5E	700MB	3108	1002	45 240 15	120 37 050 53	12 3	ELLIPTICAL	20 10 340	+17	+16	+ 6		11
13	290802	18.5N 126.3E	700MB	3130		40 310 90	250 33 130 60	12 2			+14	+15	+ 6		11
* 14	292032	18.2N 124.8E	700MB	3137			200 39 050 120	6 9							12
15	292359	18.6N 125.6E	1500FT	3152	1006	45 270 25	010 37 200 35	5 7				+26	+25	31	12
16	300539	18.1N 125.6E	1500FT	3146	1005	35 270 40	050 15 040 120	12 6				+28	+25	30	13
17	300753	17.8N 125.4E	700MB	3045	1008	5 130 30	110 9 210 90	12 6			+14	+14	+ 6		13

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM SPERRY
BEST TRACK DATA

	BEST TRACK			WARNING		ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
120218Z	16.2	132.2	30	16.5	132.1	30.	19.	0.	16.9	129.5	50.	179.	0.	17.0	127.8	65.	362.	30.	0.0	0.0	0.	-0.	0.
120300Z	16.1	131.7	40	16.2	131.4	45.	18.	5.	16.0	129.4	55.	223.	10.	16.0	127.7	65.	325.	35.	0.0	0.0	0.	-0.	0.
120306Z	17.3	131.4	45	16.3	131.2	45.	61.	0.	16.2	129.5	55.	208.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120312Z	18.0	131.9	55	16.6	132.0	40.	84.	-15.	15.7	131.1	30.	130.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120318Z	18.0	132.4	50	16.9	132.4	40.	66.	-10.	16.1	132.2	30.	58.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120400Z	17.8	132.8	45	18.0	132.9	55.	13.	10.	17.1	133.2	60.	96.	30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120406Z	17.1	133.0	40	17.1	132.8	55.	11.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120412Z	16.5	133.2	35	16.5	132.9	50.	17.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120418Z	16.0	133.2	35	16.1	132.6	45.	35.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120500Z	15.5	133.3	30	15.6	133.3	30.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	33.	149.	343.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	19.	91.	237.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	8.	11.	33.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	3.	8.	33.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	10	6	2	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 350. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 6. KNOTS

TROPICAL STORM SPERRY
FIX POSITIONS FOR CYCLONE NO. 23

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	301800	9.4N 141.5E	PCN 6			PGTW
2	302133	9.4N 140.2E	PCN 5			RPMK
* 3	302237	9.0N 140.6E	PCN 6		ULCC FIX	PGTW
4	011600	13.2N 135.5E	PCN 6	T1.0/1.0	INIT OBS ULCC FIX	PGTW
5	011800	13.0N 135.7E	PCN 6		ULCC FIX	PGTW
6	012100	13.4N 135.6E	PCN 6			PGTW
7	012215	12.5N 134.9E	PCN 5		ULCC FIX	PGTW
8	020114	13.0N 134.6E	PCN 5	T1.5/1.5	INIT OBS ULCC FIX	PGTW
9	020554	15.7N 133.9E	PCN 6			PGTW
10	020900	15.8N 133.1E	PCN 6			PGTW
11	021054	16.2N 133.2E	PCN 6			PGTW
12	021200	16.4N 132.9E	PCN 6			PGTW
13	021600	16.5N 132.5E	PCN 6	T2.5/2.5 /D1.5/24HRS		PGTW
14	021845	16.7N 132.0E	PCN 5			PGTW
15	022051	16.4N 131.6E	PCN 5			PGTW
16	022324	16.2N 131.7E	PCN 5	T2.5/2.5	INIT OBS	RPMK
17	022334	16.0N 131.5E	PCN 5			PGTW
18	030054	16.0N 131.4E	PCN 3	T3.0/3.0 /D1.5/24HRS		PGTW
19	030300	16.1N 131.3E	PCN 6			PGTW
20	030452	16.6N 131.5E	PCN 5			PGTW
21	030542	16.6N 131.1E	PCN 5	T3.0/3.0	INIT OBS ULCC FIX	RODN
22	031200	18.3N 132.4E	PCN 6			PGTW
23	031335	17.9N 131.8E	PCN 5		ULCC FIX	PGTW
24	031600	18.1N 132.2E	PCN 6	T3.5/3.5-/D1.0/24HRS		PGTW
25	031827	18.2N 131.9E	PCN 5			RPMK
26	031827	18.3N 132.5E	PCN 5			PGTW
27	032030	18.5N 132.7E	PCN 5			PGTW
28	032313	18.5N 132.7E	PCN 5			PGTW
* 29	032313	18.9N 133.2E	PCN 5		ULCC FIX	RODN
30	040034	18.5N 132.7E	PCN 5	T3.0/3.0 /S0.0/24HRS		PGTW
31	040300	17.2N 132.8E	PCN 6			PGTW
32	040530	17.2N 132.9E	PCN 5			PGTW
33	041010	17.3N 132.6E	PCN 4		ULCC 18.7N 136.0E	PGTW
* 34	041200	17.2N 132.1E	PCN 6		ULCC 19.0N 137.4E	PGTW
35	041815	16.2N 133.4E	PCN 5			RPMK
36	042150	15.5N 132.8E	PCN 5			PGTW
37	042251	15.6N 132.9E	PCN 3	T1.5/2.5 /W1.5/23HRS		PGTW
38	050000	15.4N 132.9E	PCN 4			PGTW
39	050014	15.5N 133.0E	PCN 3			PGTW
40	050300	14.9N 132.8E	PCN 4		EXP LLCC	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	030021	16.5N 131.5E	700MB	3120	1009	65 160 60	180 44 090 75	10 10			+10 + 9 + 9	2
2	030918	18.0N 131.7E	700MB	3091	1004	35 190 120	250 33 200 02	10 8			+11 +10 +10	3
3	031203	18.1N 132.0E	700MB	3049			200 80 070 12	25 3	CIRCULAR	35	+ 7 +11 + 8	3
4	032243	17.9N 132.7E	700MB	3119		70 360 20	020 65 360 20	14 3			+15 + 9	4
5	040858	16.8N 133.1E	700MB	3135	1006	40 350 70	030 41 360 50	8 1			+26 +25	5
* 6	041137	17.9N 132.6E	700MB	3149	1012		270 16 200 58	8 10			+10 + 4	5
7	042138	15.8N 133.2E	1500FT		1009	40 020 60	040 31 020 90	20 20			+29 +29 +23	6
8	042336	15.6N 133.3E	1500FT		1010	40 290 40	020 33 290 40	20 20			+28 +29 +24	6

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM THELMA
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
121412Z	8.6	142.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121418Z	9.3	141.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121500Z	10.0	139.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121506Z	10.0	138.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121512Z	11.4	137.2	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121518Z	11.8	135.9	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121600Z	12.2	134.0	40	12.1	134.0	40.	6.	0.	12.7	131.2	60.	171.	5.	13.4	128.5	65.	555.	40.	0.0	0.0	0.	-0.	0.
121606Z	12.9	133.9	45	12.8	134.0	40.	8.	-5.	14.8	132.3	60.	63.	15.	15.5	130.0	60.	589.	45.	0.0	0.0	0.	-0.	0.
121612Z	13.5	133.6	45	13.8	133.7	45.	19.	0.	16.0	129.7	55.	236.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121618Z	14.1	133.4	50	14.6	133.1	45.	35.	-5.	16.7	129.4	55.	328.	25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121700Z	14.7	133.3	55	14.6	133.2	55.	8.	0.	16.1	131.9	55.	313.	30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121706Z	15.2	133.3	45	15.6	133.0	55.	30.	10.	17.1	131.3	55.	499.	40.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121712Z	16.1	133.8	35	15.6	133.2	50.	46.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121718Z	16.8	135.1	30	16.2	133.3	45.	110.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121800Z	17.3	137.2	25	17.7	136,4	35.	52.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121806Z	17.6	140.0	15	17.7	140.0	20.	6.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	32.	268.	572.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	16.	151.	239.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	7.	23.	43.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	5.	23.	43.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	10	6	2	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1165. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 13. KNOTS

TROPICAL STORM THELMA
FIX POSITIONS FOR CYCLONE NO. 24

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	130900	7.2N 151.8E	PCN 6		ULCC FIX	PGTW
2	132021	10.9N 145.9E	PCN 6			PGTW
3	140035	6.9N 140.4E	PCN 6	T0.5/0.5	INIT OBS ULCC FIX 11.0N 150.3	PGTW
4	140300	6.0N 140.0E	PCN 6		ULCC 11.9N 149.2E	PGTW
5	140500	12.2N 140.5E	PCN 6		ULCC FIX	PGTW
6	140955	9.5N 145.3E	PCN 6		ULCC FIX	PGTW
7	141600	9.5N 142.1E	PCN 6		ULCC FIX	PGTW
8	141753	9.6N 141.4E	PCN 6			PGTW
9	142100	10.1N 139.9E	PCN 6			PGTW
10	142235	9.0N 140.2E	PCN 5			PGTW
* 11	150015	7.7N 140.0E	PCN 5	T1.0/1.0 /D0.5/24HRS		PGTW
12	150637	10.0N 138.5E	PCN 6		ULCC FIX	PGTW
13	150840	11.0N 137.7E	PCN 6		ULCC FIX	PGTW
14	150933	11.2N 137.4E	PCN 6		ULCC FIX	PGTW
15	151200	11.5N 136.9E	PCN 6		ULCC FIX	PGTW
16	151255	11.5N 136.5E	PCN 6		ULCC FIX	PGTW
17	151600	12.5N 135.8E	PCN 6	T2.5/2.5	INIT OBS	PGTW
18	151922	12.5N 135.0E	PCN 5			PGTW
19	152120	12.4N 134.6E	PCN 5			PGTW
20	160136	12.1N 134.4E	PCN 5	T2.5/2.5 /D1.5/25HRS		PGTW
21	160300	12.4N 134.3E	PCN 6			PGTW
22	160625	13.0N 134.0E	PCN 3			PGTW
23	160900	13.3N 133.8E	PCN 6			PGTW
24	161001	13.4N 133.8E	PCN 6			PGTW
25	161200	13.0N 133.7E	PCN 6			PGTW
26	161417	13.9N 133.5E	PCN 6		ULCC FIX	PGTW
27	161600	14.4N 133.3E	PCN 6	T3.0/3.0 /D0.5/24HRS		PGTW
28	161800	14.6N 133.1E	PCN 6		ULCC FIX	PGTW
29	161909	14.7N 133.0E	PCN 5			PGTW
* 30	162059	15.4N 132.9E	PCN 6			PGTW
31	162332	14.9N 133.2E	PCN 6	T3.0/3.0 /D0.5/22HRS		PGTW
32	162333	14.5N 133.6E	PCN 3	T3.0/3.0 /D1.0/22HRS		RPMK
33	170300	15.5N 133.4E	PCN 6			PGTW
34	170613	15.6N 133.2E	PCN 5			PGTW
35	170613	15.5N 133.2E	PCN 5	T2.0/2.0	INIT OBS	RODN

36	170939	15.9N 133.3E	PCN 5		PGTW
37	171031	16.1N 133.5E	PCN 5		PGTW
38	171356	15.8N 133.7E	PCN 5		PGTW
39	171600	15.8N 135.2E	PCN 6		PGTW
40	171857	16.2N 135.6E	PCN 5	T2.0/3.0 /W1.0/27HRS	PGTW
41	172311	17.7N 136.8E	PCN 5	T1.5/2.5 /W1.5/24HRS	PGTW
42	180056	17.9N 137.0E	PCN 5		PGTW
43	180300	18.1N 139.1E	PCN 6	ULCC FIX	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	160055	12.1N 134.8E	1500FT		996	45 130 07	220 42 130 7	10 2			+24 +26 +25 28	3
2	162115	14.3N 133.2E	700MB	3028		50 270 9	210 45 090 13	5 2				4
3	170008	14.6N 133.2E	700MB	3045	990	55 210 3	030 27 270 125	4 1	CIRCULAR	12	+10 +16 +10	4
4	171000	15.4N 133.2E	700MB	3067	1000		170 38 100 11	15 2			+14 +14 + 7	5
5	1[illegible]319	17.5N 139.1E	1500FT		1005	25 280 70	020 24 280 70	5 10			+25 +26 +23	7
6	1[illegible]547	17.6N 139.9E	1500FT		1004	20 040 30	350 21 040 120	5 10			+28 +28 +22	7

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL DEPRESSION 02
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		BEST TRACK WIND	WARNING POSIT		WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT		24 HOUR FORECAST WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT		48 HOUR FORECAST WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT		72 HOUR FORECAST WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
083006Z	10.1	186.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083012Z	10.7	185.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083018Z	11.2	184.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083100Z	11.7	183.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083106Z	12.0	182.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083112Z	12.4	181.9	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083118Z	12.7	181.2	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090100Z	13.0	180.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090106Z	13.3	180.3	30	13.3	179.8	30.	29.	0.	14.8	177.3	35.	118.	10.	15.9	175.7	40.	276.	20.	0.0	0.0	0.	-0.	0.
090112Z	13.5	180.1	30	13.5	179.5	30.	35.	0.	14.8	177.9	35.	99.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090118Z	13.8	179.9	30	13.8	179.9	30.	0.	0.	16.1	179.2	35.	227.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090200Z	13.8	179.4	30	14.0	179.1	30.	21.	0.	15.2	177.5	30.	230.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090206Z	13.6	178.9	25	13.7	180.5	30.	93.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090212Z	13.2	178.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090218Z	12.8	177.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090300Z	11.5	176.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090306Z	11.3	175.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	ALL FORECASTS 24-HR	ALL FORECASTS 48-HR	ALL FORECASTS 72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	TYPHOONS WHILE OVER 35 KTS 24-HR	TYPHOONS WHILE OVER 35 KTS 48-HR	TYPHOONS WHILE OVER 35 KTS 72-HR
AVG FORECAST POSIT ERROR	36.	168.	276.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	17.	117.	205.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	1.	10.	20.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	1.	10.	20.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	5	4	1	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 773. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 8. KNOTS

TROPICAL DEPRESSION TD02C
FIX POSITIONS FOR CYCLONE NO. 2

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	300546	10.2N	173.9W	PCN 6	T1.5/1.5	INIT OBS ULAC 10.1N 174.3W	KGWC
2	301026	11.1N	174.8W	PCN 6			KGWC
3	301045	11.0N	177.5W		T1.5/1.5	INIT OBS	PHNL
4	302145	11.8N	176.7W		T2.0/2.0 /D0.5/03HRS		PHNL
5	302345	12.0N	176.6W		T2.0/2.0 /S0.0/02HRS		PHNL
6	310245	12.0N	177.0W		T2.5/2.5 /D0.5/03HRS		PHNL
7	310520	12.4N	177.9W	PCN 6	T2.5/2.5 /D1.0/24HRS		KGWC
8	310545	12.6N	177.0W		T2.5/2.5 /S0.0/03HRS		PHNL
9	311145	12.8N	177.4W		T2.5/2.5 /S0.0/06HRS		PHNL
10	311540	12.2N	177.9W	PCN 6		ULAC 12.9N 178.3W	KGWC
11	311805	12.2N	177.6W	PCN 6			KGWC
12	311815	12.5N	178.2W		T3.0/3.0 /D0.5/06HRS		PHNL
13	312345	12.6N	180.0W		T3.0/3.0 /S0.0/06HRS		PHNL
14	010000	12.8N	179.7W	PCN 6	T2.0/2.0	INIT OBS	PGTW
15	010249	13.1N	179.6W	PCN 6	T2.5/2.5 /S0.0/24HRS	ULAC 13.2N 179.8W	KGWC
16	010300	13.1N	179.9W	PCN 6		ULCC FIX	PGTW
17	010545	12.3N	179.7E		T3.0/3.0 /S0.0/06HRS		PHNL
18	010600	12.9N	179.6W	PCN 6			PGTW
19	010900	13.1N	179.8W	PCN 6			PGTW
* 20	011145	11.5N	176.5E		T3.0/3.0 /S0.0/06HRS	ULCC 12.0N 179.0W	PHNL
* 21	011200	13.3N	178.6E	PCN 6	T1.5/1.5	INIT OBS	PGTW
22	011534	13.5N	179.7W	PCN 6		ULAC 12.7N 178.0W	KGWC
23	011600	13.5N	179.3W	PCN 6			PGTW
24	011744	13.5N	179.2W	PCN 6			KGWC
25	011745	13.0N	179.9E		T2.5/3.0 /W0.5/06HRS		PHNL
26	011800	14.0N	179.4W	PCN 6			PGTW
27	012100	14.0N	179.6W	PCN 6			PGTW
28	012345	13.6N	179.6E		T2.0/2.5 /W0.5/06HRS		PHNL
29	020000	13.9N	179.9E	PCN 6			PGTW
30	020236	13.4N	179.8W	PCN 6	T2.0/2.5 /W0.5/24HRS		KGWC
31	020300	13.0N	179.4E	PCN 6	T1.5/1.5	INIT OBS	PGTW
32	020600	13.7N	179.5E	PCN 6			PGTW
33	020624	13.1N	179.7W	PCN 4		EXP LLCC	KGWC

	34	021521	12.9N 177.8E	PCN 4				KGWC
	35	021723	12.4N 177.3E	PCN 4			EXP LLCC	KGWC
*	36	030224	13.9N 176.1E	PCN 4	T0.5/1.5 /W1.5/24HRS		ULAC 13.5N 179.2E	KGWC
	37	030300	12.8N 175.9E	PCN 4				PGTW

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL CYCLONE 01-83
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
080900Z	22.0	65.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080906Z	21.5	64.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080912Z	21.2	62.9	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080918Z	20.9	61.7	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081000Z	20.8	60.2	45	21.5	61.0	40.	61.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081006Z	20.7	58.9	40	20.2	58.5	45.	37.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081012Z	20.4	57.6	35	19.9	58.2	30.	45.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	48.	0.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	35.	0.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	5.	0.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-2.	0.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	3	0	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 461. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 13. KNOTS

TC01A
FIX POSITIONS FOR CYCLONE NO. 1

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	090240	22.0N	65.1E	PCN 5	T1.5/1.5	INIT OBS ULAC 21.3N 64.4E	KGWC
2	091057	21.2N	63.3E	PCN 5		ULAC 22.0N 63.5E	KGWC
3	091450	21.4N	62.5E	PCN 5			KGWC
4	100149	21.0N	59.2E	PCN 6	T1.0/1.0 /W0.5/24HRS	ULAC 20.3N 59.6E	KGWC
5	100414	19.7N	58.8E	PCN 5		ULAC 20.6N 54.2E	KGWC
6	101045	19.7N	58.4E	PCN 5		ULAC 20.4N 59.3E	KGWC
7	101429	21.4N	57.6E	PCN 5		ULAC 21.1N 58.1E	KGWC

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL CYCLONE 07-83
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		WIND	WARNING POSIT		WIND	ERRORS DST	WIND	24 HOUR FORECAST POSIT		WIND	ERRORS DST	WIND	48 HOUR FORECAST POSIT		WIND	ERRORS DST	WIND	72 HOUR FORECAST POSIT		WIND	ERRORS DST	WIND
100100Z	18.2	88.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100106Z	18.1	88.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0	0.
100112Z	18.1	87.9	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0	0.	0.0	0.0	0.	0.	0.
100118Z	18.0	87.6	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0	0.	0.0	0.0	0.	0.	0.
100200Z	18.0	87.2	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.
100206Z	17.9	86.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100212Z	17.9	86.2	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100218Z	17.9	85.7	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100300Z	17.9	85.2	45	18.3	85.3	45.	25.	0.	19.8	84.8	35.	162.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.
100306Z	17.9	84.8	50	18.6	85.1	50.	45.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100312Z	17.9	84.3	50	18.3	84.4	50.	25.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.
100318Z	18.0	83.3	50	18.2	83.2	50.	13.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.
100400Z	18.5	82.3	45	18.6	82.4	45.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	23.	162.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	25.	114.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	0.	10.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	0.	-10.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	5	1	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 370. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 5. KNOTS

TC02B-83
FIX POSITIONS FOR CYCLONE NO. 2

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	272348	16.0N	94.0E	PCN 6	T1.0/1.0	INIT OBS	KGWC
2	282327	15.7N	90.5E	PCN 6	T1.0/1.0 /S0.0/24HRS	ULAC 15.0N 91.6E	KGWC
3	300047	18.1N	89.5E	PCN 5	T1.5/1.5 /D0.5/25HRS		KGWC
4	010026	18.9N	88.8E	PCN 5	T2.5/2.5+/D1.0/24HRS	ULAC 18.1N 87.7E	KGWC
5	010600	17.5N	88.8E	PCN 6			PGTW
* 6	010831	18.3N	86.5E	PCN 5		ULAC 17.8N 86.7E	KGWC
* 7	011306	18.0N	86.4E	PCN 6		ULAC 17.7N 86.2E	KGWC
* 8	020000	17.7N	85.1E	PCN 6			PGTW
9	020005	17.8N	87.5E	PCN 4	T3.0/3.0 /D0.5/24HRS		KGWC
10	020151	17.7N	86.8E	PCN 3			KGWC
11	020300	18.0N	86.7E	PCN 6	T2.5/2.5	INIT OBS	PGTW
12	020600	17.8N	86.0E	PCN 6		ULCC 17.6N 83.3E	PGTW
* 13	021245	17.4N	85.2E	PCN 5		ULAC 17.2N 83.8E	KGWC
14	022103	17.9N	85.5E	PCN 6			KGWC
15	022344	18.3N	85.3E	PCN 6	T3.5/3.5 /D0.5/24HRS	ULAC 17.4N 84.3E	KGWC
16	030130	18.3N	85.1E	PCN 6			KGWC
17	030948	18.0N	84.8E	PCN 3		ULAC 17.2N 83.4E	KGWC
18	031200	18.2N	83.7E	PCN 6			PGTW
19	031224	18.0N	83.9E	PCN 6		ULAC 17.8N 83.3E	KGWC
20	031418	18.0N	83.6E	PCN 4		ULAC 17.7N 83.2E	KGWC
21	031600	18.3N	82.9E	PCN 6		ULCC FIX	PGTW
22	032100	18.5N	82.0E	PCN 6		ULCC FIX	PGTW
23	032233	18.6N	82.6E	PCN 6		ULAC 17.6N 82.0E	KGWC

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL CYCLONE 03-83
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
110506Z	9.6	91.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110512Z	10.4	91.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110518Z	11.2	91.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110600Z	12.3	90.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110606Z	13.3	89.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110612Z	14.3	88.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110618Z	14.9	88.5	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110700Z	15.6	88.4	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110706Z	16.0	88.7	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110712Z	16.3	89.0	35	16.2	88.8	35.	13.	0.	18.0	89.4	45.	52.	0.	21.3	89.6	50.	132.	-5.	0.0	0.0	0.	-0.	0.
110718Z	16.6	89.3	40	17.0	89.0	35.	30.	-5.	18.9	89.8	45.	42.	-5.	20.9	90.0	50.	174.	15.	0.0	0.0	0.	-0.	0.
110800Z	16.9	89.6	40	17.5	89.5	40.	36.	0.	19.4	90.1	50.	33.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110806Z	17.4	90.0	45	16.8	89.9	40.	36.	-5.	18.4	91.1	50.	127.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110812Z	17.9	90.3	45	17.4	89.3	40.	65.	-5.	19.2	90.0	40.	189.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110818Z	18.5	90.4	50	17.8	89.9	50.	51.	0.	19.8	90.2	50.	210.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110900Z	19.0	90.5	55	18.4	90.1	55.	43.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110906Z	20.5	90.8	55	19.9	90.7	55.	36.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110912Z	21.8	91.9	55	21.7	91.1	50.	45.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110918Z	22.5	92.6	35	22.8	93.8	35.	69.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	42.	109.	153.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	21.	35.	67.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	2.	8.	10.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-2.	-3.	5.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	10	6	2	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 980. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 8. KNOTS

TC033
FIX POSITIONS FOR CYCLONE NO. 3

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
	1	050947	10.2N	91.2E	PCN 6	T1.0/1.0	INIT OBS ULAC 11.5N 89.7E	KGWC
	2	052010	11.6N	90.8E	PCN 6		ULAC 12.6N 90.5E	KGWC
	3	060935	14.2N	88.9E	PCN 5	T2.0/2.0 /D1 0/24HRS	ULAC 14.2N 87.8E	KGWC
	4	062220	15.4N	88.4E	PCN 5			KGWC
	5	070000	15.9N	88.1E	PCN 6		ULCC FIX	PGTW
	6	070056	15.7N	88.4E	PCN 5			KGWC
	7	070216	15.9N	88.5E	PCN 5			KGWC
	8	070300	15.7N	88.1E	PCN 6			PGTW
*	9	070600	15.5N	87.6E	PCN 6			PGTW
*	10	070900	15.5N	87.3E	PCN 6			PGTW
	11	070923	15.8N	88.0E	PCN 5	T3.0/3.0 /D1.0/24HRS		KGWC
	12	071154	16.4N	89.0E	PCN 6		ULAC 16.1N 89.2E	KGWC
*	13	071200	15.6N	87.1E	PCN 6			PGTW
	14	071315	16.5N	89.1E	PCN 6		ULAC 16.4N 89.6E	KGWC
*	15	071800	16.7N	87.5E	PCN 6			PGTW
	16	072100	16.9N	89.3E	PCN 6			PGTW
	17	072207	16.6N	90.1E	PCN 5			KGWJ
	18	080000	17.3N	89.7E	PCN 6			PGTW
	19	080035	16.4N	90.4E	PCN 5		ULAC 17.6N 89.6E	KGWC
	20	080154	16.4N	90.1E	PCN 5		ULAC 17.4N 89.4E	KGWC
	21	080300	16.6N	89.0E	PCN 6			PGTW
	22	080600	17.1N	89.2E	PCN 6	T3.0/3.0	INIT OBS	PGTW
	23	080900	17.2N	89.3E	PCN 6			PGTW
	24	080910	17.4N	89.5E	PCN 5	T3.5/3.5 /D0.5/24HRS	ULAC 17.5N 89.2E	KGWC
	25	081200	17.4N	89.3E	PCN 6			PGTW
	26	081315	17.2N	90.0E	PCN 5			KGWC
	27	081600	17.7N	89.7E	PCN 6	T3.0/3.0	INIT OBS	PGTW
	28	081800	17.8N	89.9E	PCN 6			PGTW
	29	082100	18.1N	90.3E	PCN 6			PGTW
	30	082155	18.8N	90.6E	PCN 6			KGWC
	31	090000	18.4N	90.4E	PCN 6		ULCC FIX	PGTW
	32	090014	18.7N	91.2E	PCN 6		ULAC 19.0N 91.0E	KGWC
	33	090133	19.1N	90.4E	PCN 5			KGWC

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3/3

UNCLASSIFIED F/G 4/2 NL

END

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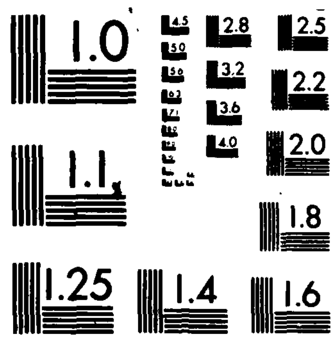
DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

34	090300	18.9N	90.5E	PCN 6		PGTW
35	090600	20.4N	90.9E	PCN 6		PGTW
36	090838	21.2N	91.3E	PCN 5	T4.0/4.0 /D0.5/24HRS	KGWC
37	091200	21.7N	91.1E	PCN 6		PGTW
38	091253	22.1N	92.8E	PCN 5		KGWC
39	091600	22.4N	93.2E	PCN 6		PGTW
40	091800	22.9N	94.6E	PCN 6		PGTW

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

APPENDIX I
CONTRACTIONS

ACCRY	Accuracy
ACFT	Aircraft
ADP	Automated Data Processing
AFGWC	Air Force Global Weather Central
AIREP	Aircraft Weather Report(s) (Commerical and Military)
ANT	Antenna
AOR	Area of Responsibility
APRNT	Apparent
APT	Automatic Picture Transmission
ARWO	Aerial Reconnaissance Weather Officer
ATT	Attenuation
AVG	Average
AWN	Automated Weather Network
BPAC	Blended Persistence and Climatology
BRG	Bearing
CDO	Central Dense Overcast
CI	Cirriform Cloud or Cirrus also Current Intensity (Dvorak)
CINCPAC	Commander-in-Chief Pacific AF - Air Force, FLT - Fleet (Navy)
CLD	Cloud
CLIM	Climatology
CLSD	Closed
CM	Centimeter
CNTR	Center
CPA	Closest Point of Approach
CSC	Cloud System Center
CYCLOPS	Tropical Cyclone Steering Program (HATTRACK and MOHATT)
DEG	Degree(s)
DIAM	Diameter
DIR	Direction
DMSP	Defense Meteorological Satellite Program
EL	Elongated
ELEV	Elevation
EXP	Exposed
FI	Forecast Intensity (Dvorak)
FLT	Flight
FNOC	Fleet Numerical Oceanography Center
FT	Feet (Foot)
GMT	Greenwich Mean Time
GOES	Geostationary Operational Environmental Satellite
HATTRACK	Hurricane and Typhoon Tracking (Steering) Program
HGT	Height
HPAC	Mean of XTRP and CLIM Techniques (Half Persistence and Climatology)
HR	Hour(s)
HVY	Heavy
ICAO	International Civil Aviation Organization
INIT	Initial
INJAH	North Indian Ocean Component of TYAN
INST	Instruction
IR	Infrared
KM	Kilometer(s)
KM/HR	Kilometer(s) per Hour
KT	Knot(s)
LLCC	Low-level Circulation Center
LVL	Level
M	Meter(s)
M/SEC	Meter(s) per Second
MAX	Maximum
MB	Millibar(s)
MET	Meteorological
MIN	Minimum
MOHATT	Modified HATTRACK
MOVG	Moving
MSLP	Minimum Sea Level Pressure
MSN	Mission
NAV	Navigational
NEDN	Naval Environmental Data Network
NEDS	Naval Environmental Display Station
NEPRF	Naval Environmental Prediction Research Facility
NESS	National Environmental Satellite Service
NET	Near Equatorial Trough
NM	Nautical Mile(s)
N/O	Not Observed
NOAA	National Oceanic and Atmospheric Administration
NOCC	Naval Oceanography Command Center
NWOC	Naval Western Oceanography Center

NR	Number
NRL	Naval Research Laboratory
NTCM	Nested Tropical Cyclone Model
OBS	Observation(s)
OTCM	One-way (Interactive) Tropical Cyclone Model
PACOM	Pacific Command
PCN	Position Code Number
PSBL	Possible
PTLY	Partly
QUAD	Quadrant
RADOB	Radar Observation(s)
RECON	Reconnaissance
RNG	Range
RT	Right
SAT	Satellite
SFC	Surface
SLP	Sea Level Pressure
SPOL	Spiral Overlay
SRP	Selective Reconnaissance Program
STNRY	Stationary
SST	Sea Surface Temperature
ST	Subtropical
STR	Subtropical Ridge
STY	Super Typhoon
TAPT	Typhoon Acceleration Prediction Technique
TC	Tropical Cyclone
TCARC	Tropical Cyclone Aircraft Reconnaissance Coordinator
TCFA	Tropical Cyclone Formation Alert
TCM	Tropical Cyclone Model
TD	Tropical Depression
TDO	Typhoon Duty Officer
TIROS	Televison Infrared Observation Satellite
TS	Tropical Storm
TY	Typhoon
TYAN	Typhoon Analog Program
TYFN	Western North Pacific Component (Revised) of TYAN
TUTT	Tropical Upper-Tropospheric Trough
ULAC	Upper-level Anticyclone
VEL	Velocity
VIS	Visual
VSBL	Visible
WESTPAC	Western (North) Pacific
WMO	World Meteorological Organization
WND	Wind
WRNG(S)	Warnings
WRS	Weather Reconnaissance Squadron
XTRP	Extrapolation
Z	Zulu Time (Greenwich Mean Time)

APPENDIX II

DEFINITIONS

BEST TRACK - A subjectively smoothed path, versus a precise and very erratic fix-to-fix path, used to represent tropical cyclone movement.

CENTER - The vertical axis or core of a tropical cyclone. Usually determined by wind, temperature, and/or pressure distribution.

CYCLONE - A closed atmospheric circulation rotating about an area of low pressure (counterclockwise in the Northern Hemisphere).

EPHEMERIS - Position of a body (satellite) on space as a function of time; used for gridding satellite imagery. Since ephemeris gridding is based soley on the predicted position of the satellite, it is susceptible to errors from vehicle pitch, orbital eccentricity, and the oblateness of the earth.

EXPLOSIVE DEEPENING - A decrease in the minimum sea level pressure of a tropical cyclone of 2.5 mb/hr for 12 hrs or 5.0 mb/hr for six hrs (ATR 1971).

EXTRATROPICAL - A term used in warnings and tropical summaries to indicate that a cyclone has lost its "tropical" characteristics. The term implies both poleward displacement from the tropics and the conversion of the cyclone's primary energy sources from release of latent heat of condensation to baroclinic processes. The term carries no implications as to strength or size.

EYE - "EYE" is used to describe the central area of a tropical cyclone when it is more than half surrounded by wall cloud.

FUJIWHARA EFFECT - An interaction in which tropical cyclones within about 700 nm (1296 km) of each other begin to rotate about one another. When intense tropical cyclones are within about 400 nm (741 km) of each other, they may also begin to move closer to each other.

MAXIMUM SUSTAINED WIND - Maximum surface wind speed averaged over a one-minute period of time. Peak gusts over water average 20 to 25 percent higher than sustained winds.

RAPID DEEPENING - A decrease in the minimum sea level pressure of a tropical cyclone of 1.25 mb/hr for 24 hrs (ATR 1971).

RECURVATURE - The turning of a tropical cyclone from an initial path toward the west or northwest to a path toward the northeast.

RIGHT ANGLE ERROR - The distance described by a perpendicular line from the best track to a forecast position. (See Figure 4-1).

SIGNIFICANT TROPICAL CYCLONE - A tropical cyclone becomes "significant" with the issuance of the first numbered warning by the responsible warning agency.

SUPER TYPHOON/HURRICANE - A typhoon/hurricane in which the maximum sustained surface wind (one-minute mean) is 130 kt (67 m/sec) or greater.

TROPICAL CYCLONE - A non-frontal low pressure system of synoptic scale developing over tropical or subtropical waters and having a definite organized circulation.

TROPICAL CYCLONE AIRCRAFT RECONNAISSANCE COORDINATOR - A CINCPACAF representative designated to levy tropical cyclone aircraft weather reconnaissance requirements on reconnaissance units within a designated area of the PACOM and to function as coordinator between CINCPACAF, aircraft weather reconnaissance units, and the appropriate typhoon/hurricane warning center.

TROPICAL DEPRESSION - A tropical cyclone in which the maximum sustained surface wind (one-minute mean) is 33 kt (17 m/sec) or less.

TROPICAL DISTURBANCE - A discrete system of apparently organized convection--generally 100 to 300 nm (185 to 556 km) in diameter--originating in the tropics or subtropics, having a non-frontal migratory character, and having maintained its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field. As such, it is the basic generic designation which, in successive stages of intensification, may be classified as a tropical depression, tropical storm or typhoon (hurricane).

TROPICAL STORM - A tropical cyclone with maximum sustained surface winds (one-minute mean)in the range of 34 to 63 kt (17 to 32 m/sec) inclusive.

TROPICAL UPPER-TROPOSPHERIC TROUGH (TUTT)- "A dominant climatological system, and a daily synoptic feature, of the summer season over the tropical North Atlantic, North Pacific and South Pacific Oceans," from - Sadler, J.C., Feb. 1976: Tropical Cyclone Initiation by the Tropical Upper-Tropospheric Trough (NAVENVPREDRSCHFAC Technical Paper No. 2-76).

TYPHOON/HURRICANE - A tropical cyclone in which the maximum sustained surface wind (one-minute mean) is 64 kt (33 m/sec) or greater. West of 180 degrees longitude they are called typhoons and east of 180 degrees they are called hurricanes. Foreign governments use these or other terms for tropical cyclones and may apply different intensity criteria.

VECTOR ERROR - The distance described by a straight line from the forecast position to the position at verification time as found on the best track. (See Figure 4-1).

WALL CLOUD - A organized band of cumuliform clouds immediately surrounding the central area of a tropical cyclone. The wall cloud may entirely enclose or only partially surround the center.

APPENDIX III
NAMES FOR TROPICAL CYCLONES

Column 1	Column 2	Column 3	Column 4
ANDY	ABBY	ALEX	AGNES
BESS	BEN	BETTY	BILL
CECIL	CARMEN	CARY	CLARA
DOT	DOM	DINAH	DOYLE
ELLIS	ELLEN	ED	ELSIE
FAYE	FORREST	FREDA	FABIAN
GORDON	GEORGIA	GERALD	GAY
HOPE	HERBERT	HOLLY	HAZEN
IRVING	IDA	IKE	IRMA
JUDY	JOE	JUNE	JEFF
KEN	KIM	KELLY	KIT
LOLA	LEX	LYNN	LEE
MAC	MARGE	MAURY	MAMIE
NANCY	NORRIS	NINA	NELSON
OWEN	ORCHID	OGDEN	ODESSA
PAMELA	PERCY	PHYLLIS	PAT
ROGER	RUTH	ROY	RUBY
SARAH	SPERRY	SUSAN	SKIP
TIP	THELMA	THAD	TESS
VERA	VERNON	VANESSA	VAL
WAYNE	WYNNE	WARREN	WINONA

NOTE:

Names are assigned in rotation, alphabetically. When last name (WINONA) has been used, the sequence will begin again with "ANDY."

Source: USCINCPACINST 3140.1 (series)

APPENDIX IV

REFERENCES

Atkinson, G. D., and C. R. Holliday, 1977: Tropical Cyclone Minimum Sea Level Pressure - Maximum Sustained Wind Relationship for the Western North Pacific. Monthly Weather Review, Vol. 105, No. 4, pp. 421-427.

Dunnavan, G. M., 1981: Forecasting Intense Tropical Cyclones Using 700 MB Equivalent Potential Temperature and Central Sea Level Pressure. NAVOCEANCOMCNE/JTWC TECH NOTE: JTWC 81-1, 12 pp.

Dvorak, V. F., 1973: A Technique for the Analysis and Forecasting of Tropical Cyclone Intensities from Satellite Pictures. NOAA Technical Memorandum NESS 45, 19 pp.

Holland, G. J., 1980: An Analytic Model of the Wind and Pressure Profiles in Hurricanes. Monthly Weather Review, Vol. 108, No. 8, pp. 1212-1218.

Sikora, C. R., 1976: An Investigation of Equivalent Potential Temperature as a Measure of Tropical Cyclone Intensity. FLEWEACEN TECH NOTE: JTWC 76-3, 12 pp.

Weir, R. C., 1982: Predicting the Acceleration of Northward-moving Tropical Cyclones Using Upper-Tropospheric Winds. NAVOCEANCOMCEN/JTWC TECH NOTE: NOCC/JTWC 82-2.

APPENDIX V

PAST ANNUAL TYPHOON/TROPICAL CYCLONE REPORTS

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Annual publication summarizing the tropical cyclone season in the western North Pacific, Bay of Bengal and Arabian Sea. A brief narrative is given on each significant tropical cyclone including its best track. All reconnaissance data used to construct the best tracks are provided. Forecast verification data and statistics for the JTWC are summarized. Research efforts at the JTWC and recent NOCC/JTWC publications are briefly discussed.

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